5 PRODUCTIVE USES OF WATER AT THE HOUSEHOLD LEVEL: EVIDENCE FROM BUSHBUCKRIDGE, SOUTH AFRICA

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Summary

Demand Responsive Approach (DRA) was the "new phrase" in the South African Water Supply and Sanitation sector at the turn of the century. The fundamental basis of this new approach was that sustainable water systems at community level can only be achieved if people are provided with the level of service they want and are able to pay for. In other words, sustainability requires understanding and being responsive to people's effective demand for water. Consequently, the obvious question to ask was how well do we understand that demand?

The answer is not very well. Our current understanding of water demand for productive uses is biased towards formal sector users of water (Agriculture, Forestry, Mining, Industry and Tourism). Very little is known about water use and demand in rural communities and most of the research has focused on water for human consumption. Systems have been designed solely to provide small quantities of drinking quality water and, in many cases, the unit cost of the water is high.

But, do these systems meet demand for water in rural areas? Are there any "productive uses" for domestic water? How much water is demanded for these other uses? Is there an effective demand for this type of water (can people afford to pay for that water)? Are there any economic benefits to the use of this water? What happens when the system does not cater for this demand? Providing answers to this type of questions is critical for practitioners, planners and policy makers in the Community Water and Sanitation sector. It will determine their ability to understand demand and therefore their ability to respond to it.

This paper discusses some of these questions and presents evidence based on research[2] undertaken in 13 communities in the Bushbuckridge District (South Africa).

5.1 Introduction and background

The beginning of the 1990s saw a shift to a new approach in the Water Supply and Sanitation sector. It stressed the consideration of water as an economic good and the importance of demand as the driving force in the Water and Sanitation sector. It was accordingly named the Demand-Driven or Demand Responsive Approach (DRA) (Sara, 1998; Garn 1998; Dreyer 1998) and is based mainly on two principles that were endorsed at the 1992 International Conference on Water and the Environment in Dublin. These were:

- Water is an economic, as well as a social good and should be managed as such
- Water should be managed at the lowest appropriate level, with users involved in the planning and implementation of projects.

The implications of this new approach for the water sector are far reaching. It focuses its attention on consumer demand, that is, the quantity and quality that consumers want at a given price. It requires that managerial decisions about the levels of service, location of facilities, cost recovery and O&M should be responsive to local needs as defined by users (community members in the case of community water supplies).

The international debate and the shift towards DRA has coincided in South Africa with a changing policy environment arising from the effort of the new democratic government to address inequalities brought about by the apartheid regime. These two trends have had profound repercussions in the Rural Water Supply Sector and together provide the general context for this research.

[1] With contributions from Sharon Pollard, John Soussan and John Butterworth

[2] J.C. Perez de Mendiguren & M. Mabalane (2001): *Economics of productive uses for domestic water in rural areas.* AWARD Research Report, Acornhoek. Full report available at available at http://www.nri.org/whirl

5.1.1 The South African policy and institutional context

Any discussion of water issues in contemporary South Africa must be set within the context of the existing dynamic changes to water laws, policies and institutional responsibilities. The process of change derives from the provisions of the Water Services Act (1997) and the National Water Act (1998). The Water Services Act gives substance to constitutional requirements with respect to rights of access to water supplies, establishes national norms and standards and defines the institutional framework for the provision of water and sanitation services. The National Water Act established the ways that water resources are to be protected, used, developed, managed and controlled, based on principles of equity, sustainability, efficiency and accessibility. Furthermore, in a fundamental departure from the previous water act, the new Water Act recognises water allocations to two water "users" prior to provision to any other sector. This is embodied in the concept of "the Reserve", which comprises both water for the river itself (to maintain ecological integrity) and water for basic human needs, which has been established as 25 l per person per day at the tap, the so-called RDP minimum standard (Pollard *et al*. 2002).

In the domestic sphere, this low initial target (there are higher medium and long term targets) reflects a definition of basic needs that assumes domestic water supply is only about health and hygiene: water for drinking, cooking, sanitation and washing. Productive activities that take place in the household have yet to be recognised in planning and allocation processes (Soussan *et al*. 2002; Pollard *et al*. 2002). As we shall see, these are a key element of the livelihoods of rural people in the Bushbuckridge area.

5.1.2 Rural water supply and sanitation sector in South Africa

Past inequalities in access to water are also reflected in the amount of information available about each sector's water demand and use. Government policies during apartheid in South Africa not only followed the logic of the Supply Driven Approach but also incorporated a paternalistic and racist component to the provision of water to South African people. The assumptions of the traditional approach were reinforced by: urban bias; a preference for white farmers; socio-political divisions based on race; and by the notion that black South Africans were unable to make decisions about their own lives. The result is that current knowledge is flawed in its focus on formal water users, namely: irrigated agriculture, forestry, industry, mining, recreation and ecotourism. And that does not take into account informal activities.

Furthermore, most of the research at the rural domestic level has focused on water for human consumption. However, in rural areas, water sources are used for a combination of *basic human consumption* (basic needs) and *productive* purposes[3]. The former refers to water used for drinking, cooking, personal hygiene, and household cleaning. The latter highlights the fact that in rural areas people engage in *economic activities* that are highly dependent on the availability of secure and reliable water supplies. Vegetable gardens, cattle farming, traditional beer making, hair salons and brick making, are some examples of the uses of water for income generation.

Therefore, under current circumstances, the need to fill the information gap regarding domestic water use becomes a priority issue for at least three important reasons:

- Understanding domestic water-use patterns and demand from a broad perspective (for both basic needs and economic activities) will improve the ability to respond to demand, the essence of DRA, and one of the important steps towards sustainability.
- As *domestic and municipal users*, previously disadvantaged communities will have to compete with the other key sectors in their quest to gain access to water over and above the *basic needs* level. If the allocation mechanism brought about by the Water Act is to be based on a fair competition between the different sectors, a better understanding is needed of the productive uses of water in rural areas, and the role that water plays in supporting rural livelihoods.
- In the context of DRA, the need to recover the cost of water service provision is now accepted as a priority for the sector (DWAF 1994; DWAF 1997a,b; Jackson 1997; Jackson 1998). The argument is that establishing effective cost-recovery mechanisms is necessary to ensure the sustainability of the water supply systems. It generates a feeling of ownership of the water systems by the community[4]

[3] There are also other religious, ritual and recreational uses for water which are neither basic nor productive, but that more or less border on health and hygiene-focused basic category (Mokgope and Butterworth, 2001)

[4] Boydell (1999), referring to evidence from the UNDP-World Bank funded schemes, indicated that, for schemes to be sustainable, communities should pay for O&M and should make a "substantial" contribution to capital costs (this contribution will vary from project to project, but should be substantial enough to generate a feeling of ownership). He also noted that principles of cost-sharing should aim at negotiated cost-sharing arrangements in which the local community chooses the levels of service for which it is willing to pay, based on a full understanding of the implications of that choice (i.e. capital and operational costs are likely to increase for higher levels of service).

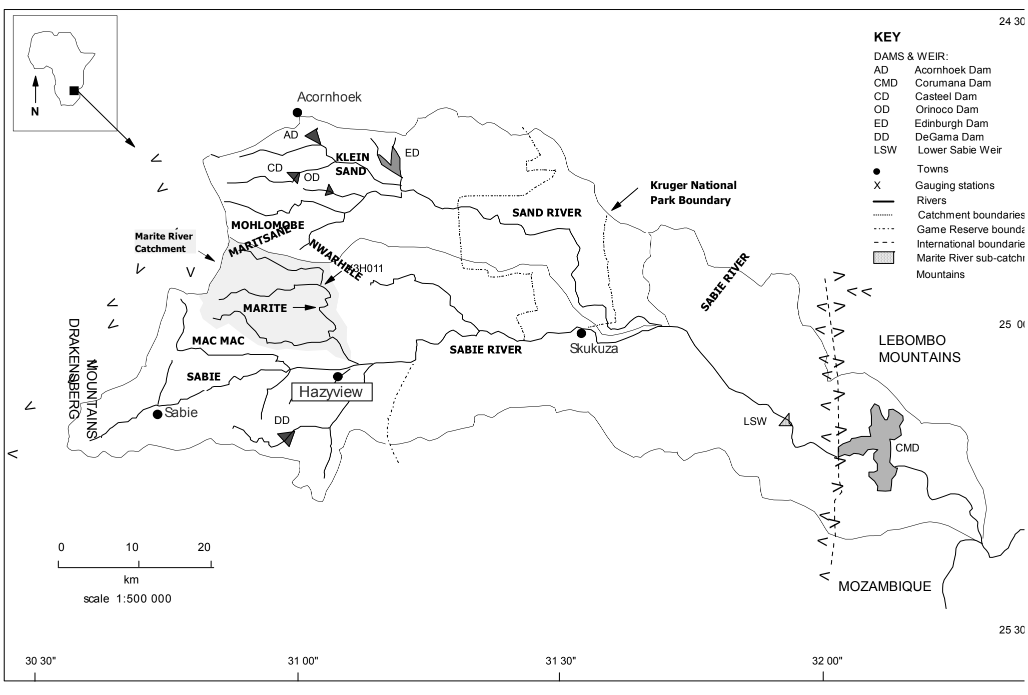
and, most importantly, it is the only way of ensuring the financial sustainability[5] of service providers, and therefore, their ability to continue the service provision into the future. The ability of the rural poor to access increasing quantities of water will not only be determined by the availability of the water (supply side), but mainly by their ability to carry the costs of the water and its supply (effective demand / ability to pay). The ability to pay, in turn, can only be enhanced by promoting income-generating activities and increasing the economic opportunities of the rural poor. Accessing water over and above the basic needs may be a necessary condition for this.

5.1.3 Research questions

The Association for Water and Rural Development (AWARD) - a rurally-based South African NGO, has been working directly with rural communities in the Bushbuckridge area since 1993. The main focus for AWARD has been to support formerly disadvantaged communities in their efforts to secure access to sustainable water supply systems and, therefore, the AWARD team has developed an understanding of the context in which domestic water is used in these communities. After identifying key gaps in current knowledge about domestic water use in Bushbuckridge, a research process was designed in order to answer the following questions:

- Given the current minimum national standards for domestic supply (RDP minimum standards: 25 l/p/d within 200 m from the household), and current use patterns, does this minimum standard meet basic needs in rural Bushbuckridge?
- What are the productive uses for domestic water? How much water is used for these productive activities?
- What are the economic benefits generated from these activities?
- Do people pay for water in Bushbuckridge? (Is there an effective demand for water?)
- Are people willing to pay for the water? What factors affect "willingness to pay" for water?

5.1.4 The study area



Figue 1. The study area

The study area[6] for the research was the Bushbuckridge district. The Bushbuckridge (BBR) district (31°0' E - 31°35' E and 24°30' S - 25°0' S), is located in the South African lowveld, on the border between the Mpumalanga and Northern Limpopo provinces[7]. Covering an area of 240 km², Bushbuckridge is roughly

[5] Sustainability is defined here as: the benefits of the water-supply project continuing indefinitely in a reliable manner at a level genuinely acceptable to the community it serves and close to the design parameters, without an unacceptable level of external managerial, technical or financial support (DWAF 1997b).

[6] Extensive details for the entire district are provided by Shackleton *et al* (1999). Detailed information on the northern and midland areas of BBR, falling within the Sand River Sub-catchment, is also given in Pollard *et al* (1998).

[7] Known as Northern Province prior to July 2002.

bounded by the Orpen Road to the north, conservation areas in the east, the Drakensberg mountains in the west and the Sabie River in the South (see figure 1). The Sand and the Sabie are the major rivers flowing through Bushbuckridge. Mean annual precipitation (MAP) for the district is 600 mm, with about 65% of the district receiving less than this. Rainfall is concentrated during the summer months (October to March) while cyclical droughts are a common feature in the district.

Typical of many densely populated former homeland areas of the country, high unemployment is one of the main socio-economic characteristics in Bushbuckridge. The unemployment rate for Bushbuckridge is 40% of the active population. Livelihood options include (limited) irrigated agriculture, dry-land farming, animal husbandry, harvesting of wild plant and animal resources and a variety of small businesses. Furthermore, with formal sources of income becoming limited and saturated, increasing numbers of people are turning to the informal economy for income generation. Informal sector activities range from food processing and beer brewing, small scale retailing of fruit and vegetables, low-cost household goods, wood carving, reed mats, other craft work, and selling wild herbs. For most households it is not unusual to be involved in more than one of these activities at the same time in an effort to diversify sources of income. Some of these activities depend on domestic water as an important input in the production process.

Reliable access to safe water of a sufficient quantity continues to be one of the major problems for many people in Bushbuckridge, particularly in rural settlements. This is due to a combination of socio-economic, historical and natural factors (source constraints), which result in poor infrastructure and management of water resources. Both groundwater and surface water are important sources of water for villages in the area. Communal standpipes (public taps) are the standard level of service in the rural settings (see Table 1), while piped water in houses is more frequent in the declared townships of the area (Thulamahashe, Dwarsloop, Shatale and Mhkuklu). However, there are spatial variations in water service provision (regarding quality, quantity, reliability and distance to the source[8]) even at the village level. Situations where some people in the village are irrigating their lawns while, a short distance away, others are queuing to fill up buckets of water are everyday scenes in Bushbuckridge. In some areas people still have to use water from rivers, unprotected springs, or wells dug in the riverbeds for human consumption.

Table 1 Level of domestic supply for households in Bushbuckridge

Level of domestic supply	% of households
Piped water in dwelling	14
Piped water on site	16
Public tap	50
Water-carrier/tanker	1
Borehole/rainwater tank/well	11
Dam/river/stream/spring	6
Other	2

Note: Data derived from the 1996 Census

5.2 Methodology

5.2.1 General approach

A comparative village-case-study approach was used in the study. Based on institutional and climatic differences, Bushbuckridge was subdivided into 6 areas: north-west, north-east, mid-west, mid-east, south-west, south-east. Within each area two villages of similar socieconomic and physical attributes but diametrically opposed domestic water supply situations were chosen[9]. For the purpose of this study,

[8] For descriptions of water infrastructure in the area see AFRICON Consortium, 1998; Pollard *et al* 1998; Chunnet and Fourie, 1990.

[9] Although selection of case study communities tried to control for factors other than the differences in access to domestic water supply, this was not always possible. Some of the differences in the analysis presented in the research are conditioned by factors other than access to domestic water supply. When possible these factors were identified and their importance assessed using qualitative data and/or anecdotal evidence.

villages in each pair were termed as either "worst case" or "best case". The criteria for selection are shown in Table 2. The survey covered a total of 13 villages that had a combined population of over 15,000 people. Table 3 summarises the main population statistics for the case study villages.

Table 2 Research categories and main characteristic for each category

Category	Characteristics
"Best case scenario" villages/sections	• Functional reticulated supply. Minimum RDP standards met for all households • Most households have one or more yard taps • Very few households have in-house connections. • Water supply is very reliable • Yard tap is the highest level of service
"Worst case scenario" villages/sections	• No reticulated supply in the village (or non-functional). • Minimum RDP standards are not met for all households • Large differences in the level of service between households • People walk long distances and queue to fetch water • Supply is very unreliable and people face long periods without water. • Most households suffer severe shortages of water. • Private vendors are common • Community tensions arise due to differences in access to water

The research was part of a learning process both for AWARD and for the communities involved. It included the collection of data from a combination of primary and secondary sources[10]. Most data were obtained through intensive fieldwork using participatory methodologies. Figure 2 provides an overview of the process followed at village level. Six to seven days were spent in each of the villages over the study period. Emphasis was placed on allowing community members enough time to discuss research issues.

Table 3 Population statistics in case study villages

"Best case scenario" villages				"Worst case scenario" villages			
Village	Total pop.	No. of hh	Ave hh. Size	Ave hh. Size	No. of hh	Total pop.	Village
Shortline	165	35	4.7	4.9	360	1800	Violetbank F
Dingleydale	1759	268	5.5	5.6	314	1765	Township
Boshoek &Matafeni	1225	175	7.1	5.9	20	119	Itereleng
Utha	1250	221	9.8	5.2	76	430	Dixie
Xanthia A	1023	165	6.3	7.5	207	1594	MP Stream C
Kildare B	1729	290	6	7.4	378	2007	Mabharule
				5.8	29	165	Tsakane
Class Average			6.2	6.1			Class Average

Methods for data gathering included group discussions (with specialist and non-specialist groups), household interviews (semi-structured) and in-depth interviews with individuals. Semi-structured household interviews were conducted in all villages to complement and validate the information gathered in very informative mass meetings and group discussions. In communities where data collected in the mass meetings was insufficient, a random sample of households was interviewed. Sampling frames were constructed for each village. Existing village maps were ground-tested, modified and used when possible. ESKOM (South Africa's electricity utility) maps were used in one community. Maps from the Agincourt Demographic and Health Information Project (CCP)[11] were also used in communities in the Agincourt area. Participatory mapping exercises were carried out in villages in which maps were not available or were very inaccurate.

[10] Full references for all the secondary sources are provided in the research report (Pérez de Mendiguren & Mabalane, 2001).

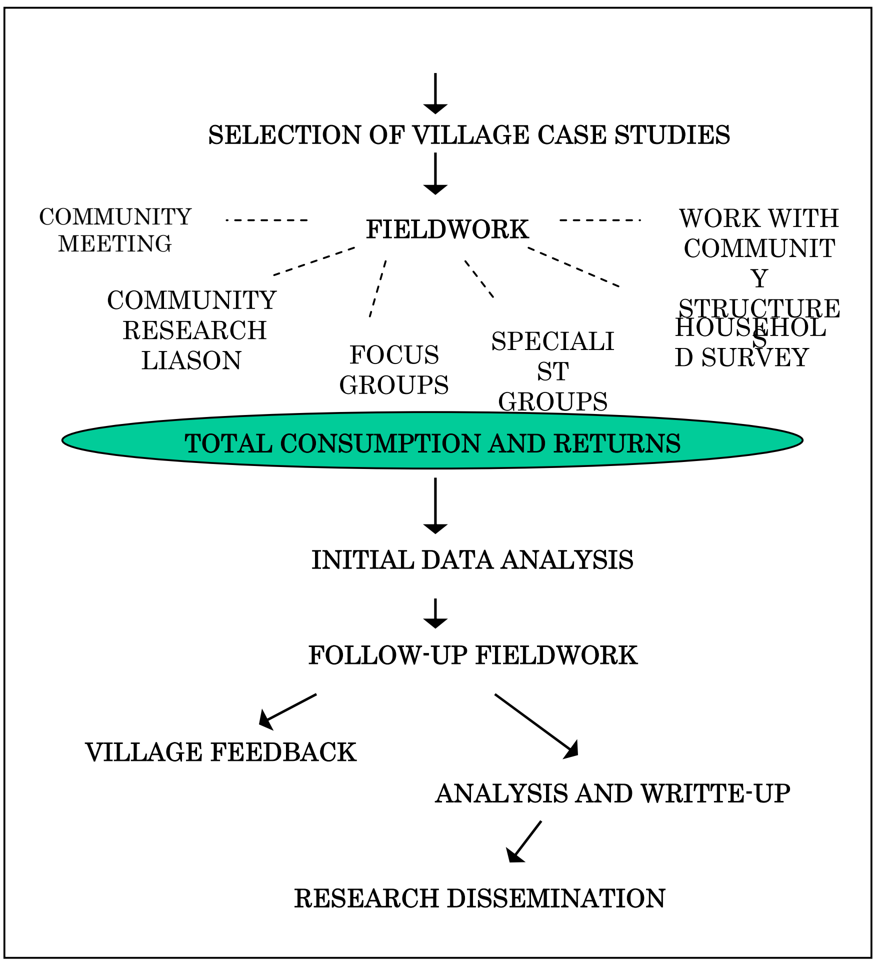
[11] The Agincourt Demographic and Health Information Project (CCP Project) is co-ordinated from the Health Systems Development Unit (HSDU) based at the Tintswalo Hospital, Acornhoek. The have produced a Population Fact Sheet for each of the villages in which they work. Each fact sheet contains a computerised version of a village map produced by fieldworkers and villagers in each of their project villages.

5.3 Method for data aggregation

As a general procedure, average water consumption patterns and gross margins for each productive activity were calculated and aggregated for each village and also for the combined categories of villages ("best case villages" and "worst case villages") in order to obtain inter-village and inter-category comparisons. Statistical tests were then conducted to determine whether the observed differences between "best case" and "worst case" were significant.

Some caution is required when translating household consumption into average per capita consumption. The underlying assumption being that, irrespective of their age and gender, all individuals within a household have equal access to equal amounts of domestic water, to the health and economic benefits it can generate and also equal rights to prioritise its use. Household dynamics in Bushbuckridge are complex due to a combination of issues related to kinship relations (extended families), the existence of polygamy, and the high prevalence of migrant workers. Age and gender differences in the access to resources are very acute and decisions over the allocation of resources happen in the context of the different set of objectives that exist for individuals within the household (as opposed to a unique set of objectives for the household).

Figure 2 Overview of the research process



5.4 Discussion of results

5.4.1 Water for Basic Needs

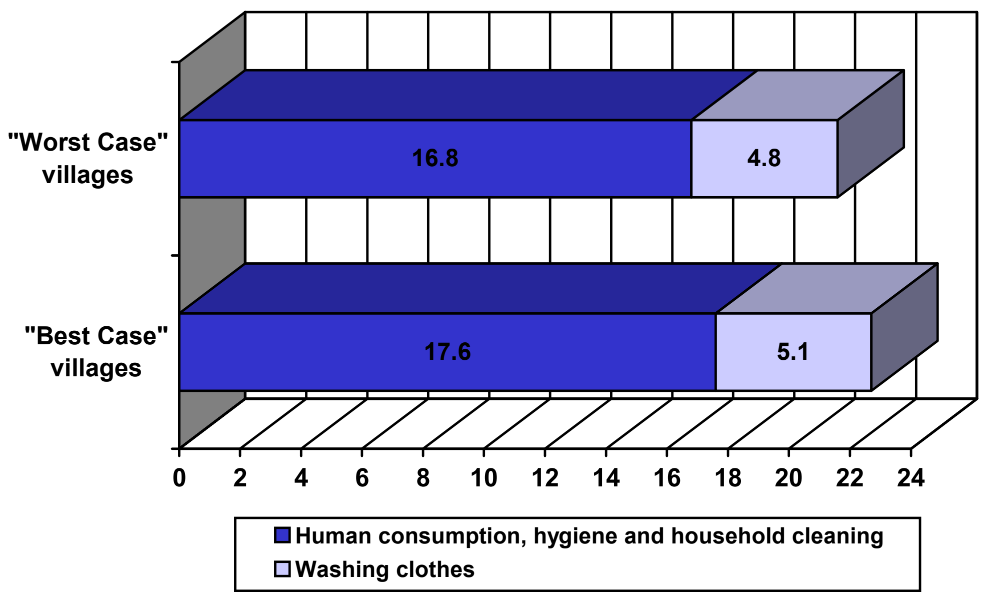
All households, of course, use water for their basic consumption needs: for drinking, cooking, bathing and washing clothes and utensils. The amounts used varied somewhat according to the quality and proximity of the water supply and the size and wealth of households, but in almost all villages the average use for these purposes was close to or below the minimum 'basic needs' figure of 25 l per capita per day.

There was no statistical difference in the quantities of water used for these purposes between villages with good water supplies and villages where supplies were poor. Recorded averages for the two categories of villages show that water consumption was only 1.2 l higher in villages with better water supply (22.4 l/p/d compared to 21.2 l/p/d). In other words, with the available data it can be concluded that consumption for basic needs is generally similar between villages regardless of the water supply systems (at least within the range studied in the area).

The general absence of in-house water connections in surveyed households is one explanation for this result. For households with access to yard taps, it was still observed that women found it more convenient to store water for daily use in the kitchen or inside the premises so use was similar to that found when only communal taps are available. Significant differences in consumption (at least for drinking, cooking and household cleaning) are not expected unless the household has access to in-house connections and probably water-based sanitation systems – flush toilets, but also showers/baths[12]. Evidence from research elsewhere in Africa also shows that if water must be carried, the quantity brought home varies little for sources between 30 m and 100 m from the household (White, Bradley, and White, 1972).

In many cases accessing 25 l/p/d of water meant women spending a long time fetching water from distant sources, queuing for water at communal water points or buying water from vendors. There were also concerns about water quality in some cases. The main benefits of improved water supplies for basic needs was seen to be the time saved in fetching water rather than the increased amount that could be consumed. These time savings were extremely significant for women and children in particular, freeing up time for other livelihood activities or for leisure or study time.

Figure 3 Mean consumption for Basic Needs in both research categories (l/p/d)



5.4.2 Productive uses of domestic water

The research found a wide range of water-dependent productive activities in the study area. While some of these activities are lifestyle improvements (as opposed to profit orientated activities) they provide goods and services to poor households, and constitute an important part of the livelihoods of participating families.

[12] In a "before/after" case study carried out in Utha after their domestic supply was improved to RDP minimum levels, households indicated that the quantity collected for their daily used had not increased, although the time invested in fetching water had clearly decreased.

The main water-dependent productive activities were vegetable gardens, fruit trees, beer brewing, brick making, hair dressing, livestock (cattle and goats) and ice block making. A similar list of activities was found in most villages, though the importance of different ones varies from village to village. Many other activities were cited in one or two villages. These included grass mat weaving, smearing and plastering of walls and floors, medication and religious uses, baking, poultry, duck ponds and car washing.

5.4.2.1 Vegetable gardens

Where adequate water is available the most common productive water use is vegetable gardens (also referred to as "private gardens" to differentiate them from community gardens). They are small portions of land used to grow vegetables such as tomatoes, cabbage, lettuce, and pepper, in the winter; and rainfed field-crops such as maize, groundnuts, and cassava, in the summer. As opposed to other agricultural land and communal gardens they are normally located within the individual homestead and irrigated with domestic water. Most of the produce is for household consumption, but some is sold in local and regional markets. Private gardens are generally small (30 m^2 to 600 m^2) and the amount of time and effort dedicated to them varies from household to household.

The existence of private vegetable gardens (particularly during winter) is an indicator of the status of the domestic water supply in a village. 45% of all sample households in "best case scenario" villages were growing vegetables at the time of the interview, however, only 14% of households in "worst cases scenario" villages were doing so. Also, the average water consumption for irrigation was much higher in "best case" villages (32.2 l/c/d) than in "worst case" villages (8.3 l/c/d). Both differences were statistically significant. In "worst case scenario" villages, the inability to engage in gardening activities was often raised as a concern in meetings and, together with fruit production, it was identified as one of the activities that people would undertake if there were more favourable conditions such as an improved water supply.

5.4.2.2 Fruit trees

Many homestead plots also contain a number of fruit trees, which provide shade and have aesthetic value as well as giving fruits. The most common types of fruit trees are mango, litchi, banana, paw-paw, avocado, guava and peach. The existence of fruit trees as a crop can also be a good indicator of the water supply situation in a particular village. However, trees will survive long periods without water, particularly if they are adult, so a less reliable supply is needed than for vegetables. Also, since trees provide other services such as shade they are common even in villages with poor domestic supply, although they are less likely to be productive. Households in "best case" scenario villages tend to have a significantly higher number of fruit trees in their homesteads, with the average number of trees increasing from 8.6 per household in "worst case" villages to 13.6 per household in best case villages. Furthermore, villagers in "best case" villages use a significantly greater amount of water for their trees than those in "worst case" villages (12.7 l/c/d and 4.4 l/c/d respectively), where irrigating trees with "recycled water" ("grey water") is a common practice.

5.4.2.3 Building

Building was another productive use for water that showed important differences between villages with good and bad water supply. Families in Bushbuckridge normally build their own houses. Households extend their living space when need arises and some building activity happens nearly every year in any given household, mainly during the rainy season when more water is available. Even if the building activity does not translate into a monetary income for the household members, it provides housing services that would otherwise have to be hired or bought. In addition, some individuals make cement bricks for sale. Regarding water consumption, the data collected shows that households in both "best" and "worst" case scenarios are equally as likely to undertake some building activity. However, amongst households that decide to build, those in "best case" scenario villages use more cement (49 bags of cement versus 29 bags per year per house), and hence use a significantly higher amount of water.

5.4.2.4 Brewing

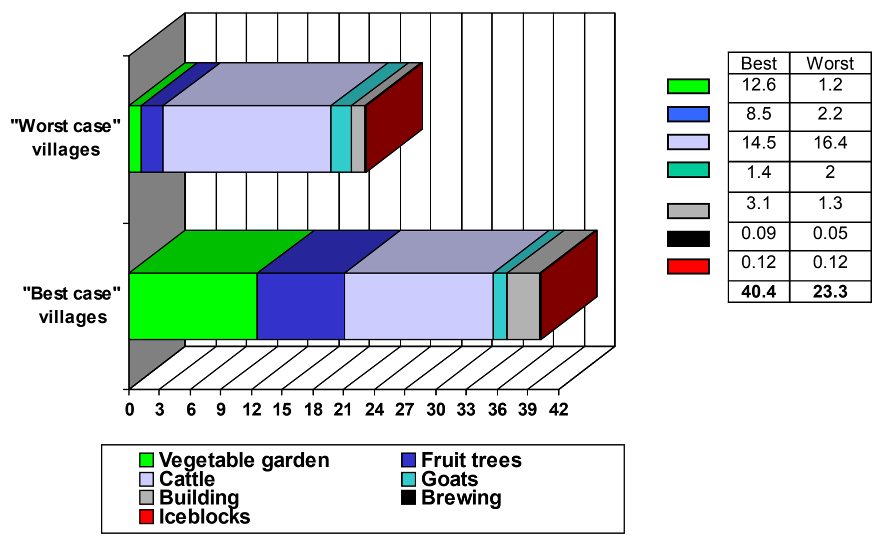
Brewing traditional beer is a common practise amongst most rural households in Bushbuckridge and is normally associated with functions, festivities, rituals and ceremonials. Normally, the beer produced for such events is not sold but given away to friends and family and/or consumed in the household. The research concentrated on commercial brewers. They brewed at least once a month through the year, although it was often on a weekly basis. Beer brewers were normally old women living in poor households. In many areas brewing and selling traditional beer was stigmatised as it normally involved hosting a "shebeen" (unauthorised bar). Brewing beer was also perceived as an indication of poverty and often respondents indicated that they would only brew beer to sell if they had no other income option. There are differences in the amount of water used between brewers in "best" and "worst" villages. The total number of l brewed per day is 72% higher in "best case" villages (625.8 versus 364.2). Also brewers in villages with good supply brew an average of 28.4 l/brewer/day, whereas those in bad supply villages only 17.3 l/brewer/day.

5.4.2.5 Livestock

The source of water for cattle is often not from a 'domestic' system, but outside the village (cattle dams, rivers and springs). Livestock can be moved to more distant water sources, hence, in villages where the water supply system is poor but there are alternative sources of water, it is still possible to raise cattle. This is confirmed by the absence of significant differences between "best case" and "worst case" scenario villages in all the variables examined in this section (% ownership, livestock numbers and water consumption) for both cows and goats. Nevertheless, the following reasons lead to the inclusion of livestock amongst the consumers of domestic water:

Fieldwork in Utha, Dixie and MP Stream C showed that the relationship between livestock ownership and availability of "domestic water" was more complex than initially assumed. Livestock was perceived as a competing user for domestic water, particularly in times of water stress, when domestic supplies may keep livestock alive. In some villages, failure to provide appropriate facilities for livestock consumption had resulted in cattle and goats using communal taps, causing damage to facilities and creating health hazards. Also people in Utha and Dixie indicated that villagers had at times vandalised reservoirs and storage facilities in order to access water for their livestock in times of stress.

Figure 4: Summary consumption for main water-based livelihood activities in "best cases" versus "worst cases (l/c/d)



5.4.2.6 Overall results

In general, there were major differences in the quantity and pattern of water use for livelihood activities between villages dependent upon the performance of their water supply. Figure 4 summarises the average water consumption for all productive activities. For each village, these figures take into account the total number of people involved in each activity and average their consumption across all households, regardless of whether they are involved in the activity or not. Therefore, the figures presented here provide a conservative estimate of the per capita amount of water that is needed to support the current level of productive activities.

The main conclusion from these figures is that an additional 40 l/p/d are able to support a wide range of productive activities (given current proportion of households involved in the activities and water consumption). The activities using most water are cattle ranging, vegetable gardens, beer brewing and watering trees. Also, the comparisons between consumption in "best case" and "worst case" villages provides an indication of the likely increase in water consumption with improved water supplies. Water consumption for all activities except for livestock and ice-blocks, is much higher in "best case" villages. The most important increases occur in the irrigation of gardens (950%), irrigation of fruit trees (286%), building activities (138%) and beer brewing (80%).However, as they are averages for all households, the figures above do not reflect the real amount of water used by a household involved in a particular activity, The amount required for individuals involved in each activity is much higher than above average. Figure 5 provides average consumption figures for each activity, when only those households engaged in the activity are considered.

Figure 5: Water consumption per business in households involved in the business (l/c/d)

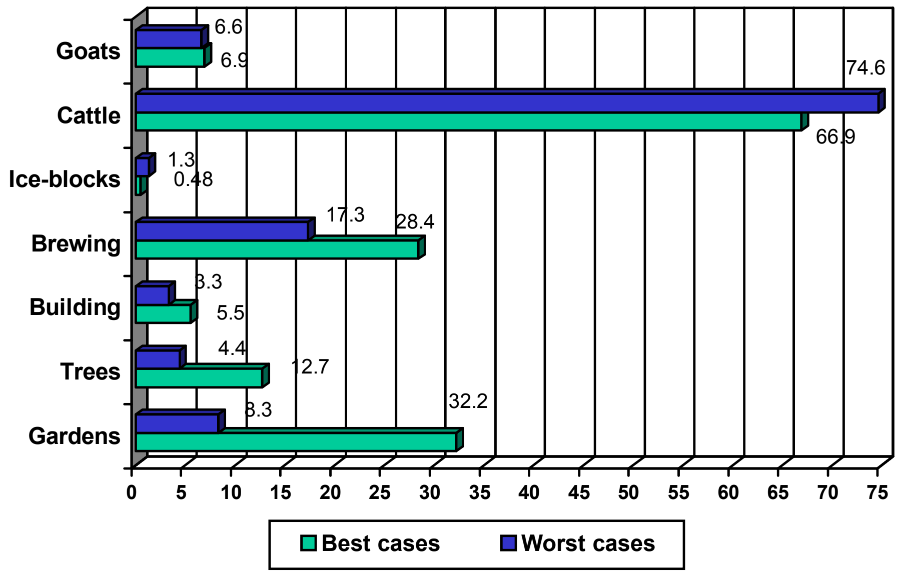


Figure 6: Percentage of households involved in each activity (%)

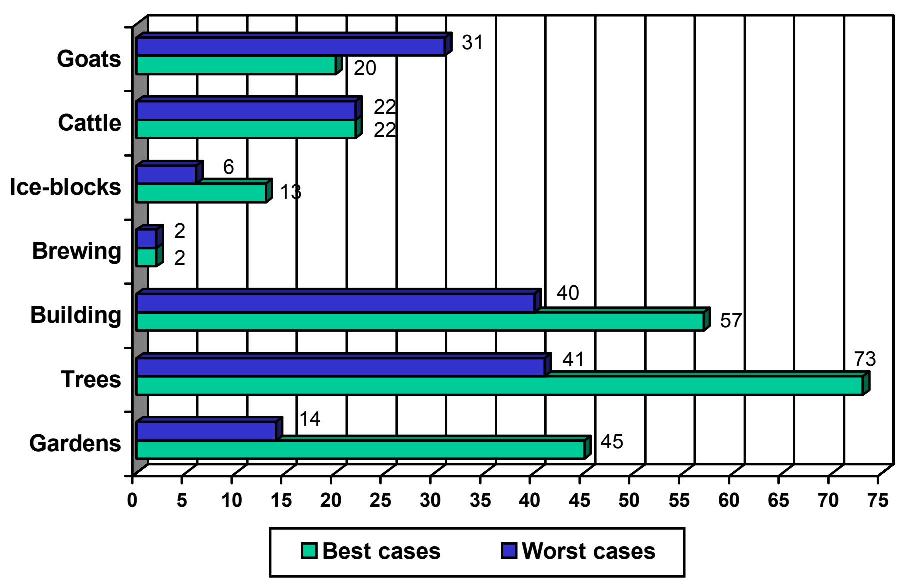


Figure 6 provides an overview of the average level of involvement of households in each of the activities. Not all households engaged in water-dependent productive activities. In "best case" villages, the proportion of households involved in each activity ranged from 2% of the households for beer brewing to 73% for the irrigation of fruit trees. Moreover, for most activities, the proportion of households involved was also higher in "best case" villages than in "worst case villages". Also, households in "best case" villages are more likely to be involved in more than one productive activity (60% of households in "best case" villages as opposed to 38 % in "worst cases" were involved in 2 businesses, while the percentages of households involved in 3 businesses were 11% and 3% respectively). This demonstrates that the

ability to participate in these livelihood opportunities is directly related to the location and reliability of the water supply - a conclusion supported by the views of the participants in the research.
We can consequently see that the productive use of domestic water is extremely common throughout the Bushbuckridge area, and in all probability would be even more widespread if all communities had reliable access to a convenient water supply.

5.4.3 Income from productive uses of domestic water

The economic significance of domestic water-based activities was measured by looking at the income generated from each activity. Gross margins[13] per litre of water were calculated for each activity and then multiplied by average consumption. The limitations of the results presented below relate to the fact that neither the cost of the labour input to each activity, nor the price of water were included in the calculations of gross margins. Further research should be conducted to include these factors (direct and/or indirect cost of engaging in the activities, including the time spent in fetching water) and to refine the gross margin figures presented here.

Figure 7 Gross margins for " water-dependent low-level economic activities" (R/litre)
(10.5 Rand = US$1)

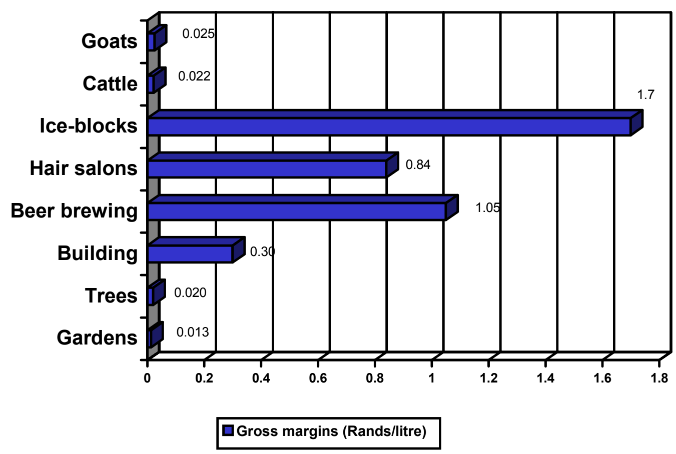


Figure 7 presents an overview of the "gross margins" for all activities. They show a wide variation across businesses. Ice-block making provided the highest return (1.7 R/l) followed by beer brewing (1.05 R/l) and hair salons (0.84 R/l). Building was next (0.3 R/l), followed by livestock rearing (0.025 R/l) and fruit trees (0.02 R/l). Vegetable gardens (0.013 R/l) provided the lowest return. Returns for the last three activities are much smaller than the rest because activities are relatively more intensive in water use.

Paradoxically, the highest rates of involvement in the productive use of domestic water are for those activities with the lowest returns per litre of water. This is the case for fruit trees and vegetable gardens. In contrast, beer brewing and ice-block making activities providing the highest returns per litre, have the lowest rate of household involvement. This may be due to the fact that the activities with highest returns (beer brewing, hair salons, ice-block making) are mainly undertaken for commercial purposes with most of the product being sold in local markets in order to generate cash income. As markets for these activities tend to be very local (one village), there is only a maximum amount of such businesses in any given village.

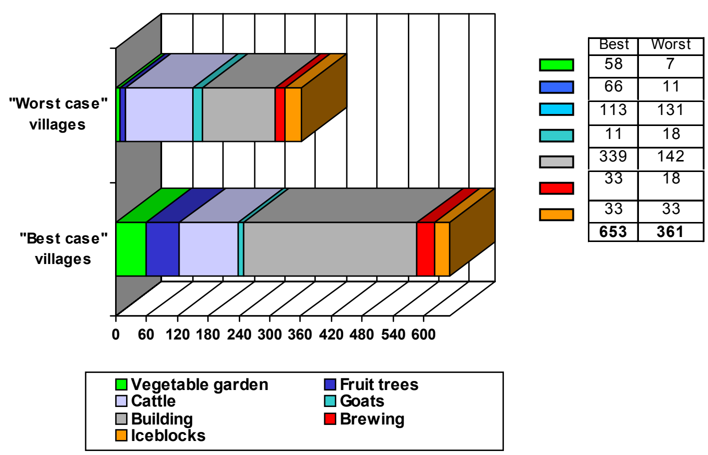
On the other hand, activities with comparatively lower returns such as fruit and vegetable production, normally have a dual purpose, namely, for income and consumption. In the case of private gardens, estimations of self-consumption varied from 50% to 80% of the product for the biggest backyard gardens and 100% for the smallest ones. Therefore, as they are not that dependent on the size of the market, these activities are the most likely to happen when access to water improves.

[13] Gross margins = Income minus operating cost. Capital cost for the activities were not included.

Gross margins from irrigation of gardens and trees[14] may be low but the welfare impact, and the economic benefits for those who engage in this activity, can be much higher. The health benefits derived from a more diverse diet and the regular consumption of fresh fruit and vegetables are widely acknowledged. Furthermore, having access to small but reliable sources of income from gardens and fruit trees can contribute to lower income insecurity and allow for the benefits to be reinvested in other activities. A pilot project using productive water points to irrigate gardens in southern Zimbabwe states that: "*For women with little access to cash, materials or productive resources, obtaining a steady seasonal income from the scheme has greatly lowered elements of risk and income insecurity in he households decision making and planning processes."* Also, reliable income flows have allowed the *"revival and blossoming of 'revolving funds' at productive water points"*. (Lovell, 2000).

Figure 8 summarises the returns from all household-based economic activities in both types of villages. This income reflects an average value for all activities when estimated across all households, regardless of whether each household engages in the activity or not (under current proportion of household involvement and water consumption). Total income generated from these economic activities averages R361 to R653 person/year (10.5 Rand = US$1) although the actual amount earned varies from household to household and community to community.

Figure 8: Total gross margins from water-dependent livelihood activities in the two types of villages (R/capita/year)



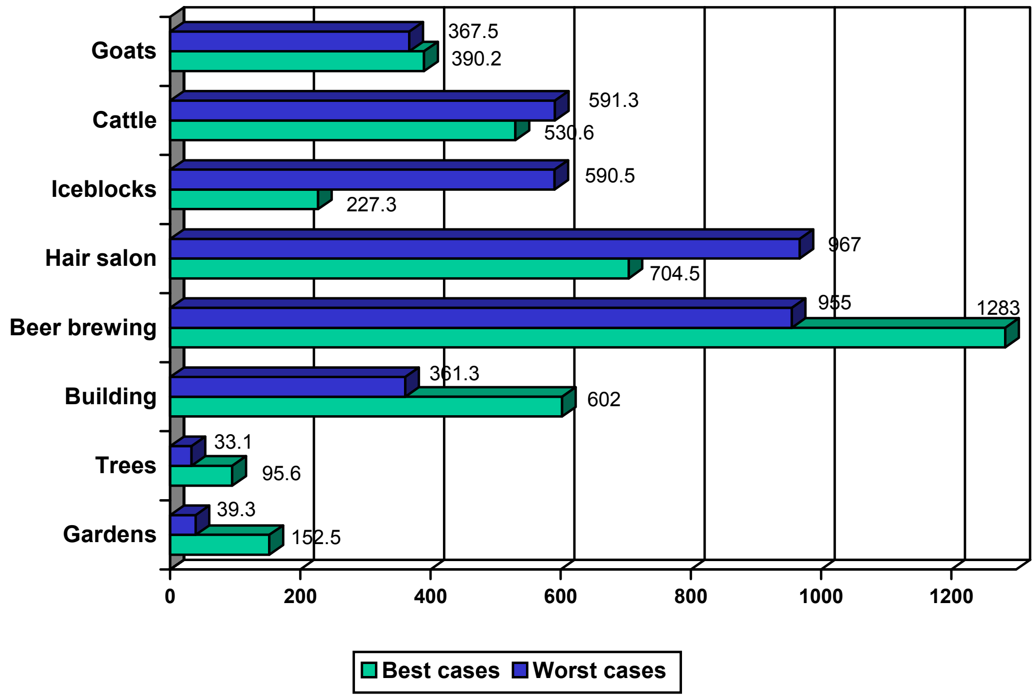
Given current income level in the Bushbuckridge area (R2,106 per year), the income from productive uses of domestic water represent around 17%of average household income in "worst case scenario" villages and 31%in "best case" villages where water supplies are not a constraint upon these livelihood activities. In fact, from the figures presented above, it can be concluded that the extra 6,241.5 l per capita per year (17.1 l/c/d) available to individuals in "best case scenario" villages translate into an extra R292 per person per year (46,7 R/m^3).

The income levels in Figure 8 show the average benefits of an additional water allocation, but they do not reflect the real income generated by a household involved in a particular activity. Figure 9 provides average "gross margin" figures for each activity, when only those households that engage in the activity are considered. The figures are, of course, higher, showing that for those households engaged in these activities they are a major source of livelihood. This is particularly true for the poorer households, many women-headed, involved as their income is often far below the average figure for the region.

Overall, the data presented here demonstrate the importance of the use of domestic water for productive activities in the livelihood systems and the general economy of Bushbuckridge. It can be concluded that the inability to access domestic water for productive purposes can reduce considerably livelihood options in an area, particularly for poor and vulnerable households, who have limited access to livelihood access assets and few alternative income opportunities. For these people, growing fruit and vegetables, running a hair dressing salon or brewing beer can be the key to avoiding, or at least reducing, poverty.

[14] Gross margins for vegetables were done on the total value of production – inputs, not only on the value of the part that was sold.

Figure 9: Annual gross margins per capita for those involved in each activity (R/capita/year)



These results offer a first assessment of the role of productive water use in rural livelihood systems in Bushbuckridge. However, the insight into rural livelihoods provided by this research is somewhat limited. How these water-based livelihoods feature in the overall livelihood strategies for rural households remains largely unanswered and should be the focus of further research. The evidence from Zimbabwe (Lovell, 2000) shows that the livelihood impact of increased access to water for productive uses can be very important. Income from productive water points (mainly used for vegetable production) has created opportunities for those, with limited access to cash or productive resources, to start their own income-generating activities. As stated by Lovell, it has been shown how obtaining a steady seasonal income from a productive water point lowers elements of risk and insecurity in the household budget and decision making process. Surveys carried out at standard (non-productive) domestic water points draw attention to the difference that a secure source of income from a productive water point can make in enhancing broader production systems.

5.4.4 The cost of providing extra water

When considering the cost of meeting the needs to use water productively, the most important factor is the incremental cost of supplying more water. Capital and operation and maintenance costs for water systems in South Africa are shown in Table 4. These figures can help contextualise the gross margin figures presented in the previous section.

There are huge increases in costs when moving from hand pumps supplied by groundwater to any kind of piped water supply. But, after this leap has been made, the additional capital costs involved in moving from communal standposts supplying as little as 15 l per person per day to systems supplying 25, 60 or 120 l is much less then the proportional increase in water supplied. Interestingly, operation and maintenance costs are shown to increase much more when improving supplies to a high standard urban system (e.g. by 50% from 60 to 120 l per person). The benefits of productive uses of domestic water supplies need to be set against these incremental capital and O&M costs in supplying water.

The extra capital cost implied in designing a system to supply 60 l/p/d from roof tanks compared to 25 l/p/d from yard tanks is R800 per household. The extra O&M costs over 20 years would be R960. For this extra cost, an additional 35 l/p/d is available, equivalent to over 1,500 m^3 over twenty years. The combined additional cost per m^3 is only R1.1. On the other hand, gross margins presented in Figure 7 ranged from R13 – R20 per m^3 for vegetable gardens and fruit trees (the most common use of extra water) to R1,050 – R1,700 m^3 for beer brewing and ice block making.

Table 4 Costs of providing different types and levels of water supply, South Africa (Rands)

Service level	Rural - handpump	Rural/ peri-urban - communal standpost	Urban – yard tank (low pressure)	Urban - roof tank (medium pressure)	Urban - piped water and house connection (full pressure)
Typical consumption (l/p/d)	15-25	15-25	25	60	120
Capital cost (per household)	250	3,050	3,900	4,700	5,300
O&M costs (per household / month)	4	14	20	24	38

Note: Figures compiled from 2 studies carried out for DWAF. O&M costs exclude capital repayment

5.4.5 Payments for water and willingness to pay

Although the debate around payment for water is high on the water policy agenda, implementation is a controversial issue in Bushbuckridge, as in much of the rest of South Africa[15]. Moreover, as controversial as it is, the debate around cost recovery and payment for water is also confused by a series of assumptions around the rural domestic water sector that are too often incorrect and contribute to an incomplete analysis of reality. Some of these are:

- People in rural areas do not pay for water
- Ability to pay for water is the main problem.

That rural inhabitants do not pay for water cannot be assumed in general. Evidence from this research indicates that the opposite may well be the case. Formal arrangements for the payment for water are absent from most villages in Bushbuckridge. However, prices paid by rural households can be much higher that prices paid in areas where proper cost-recovery mechanism are in place.

Direct water-vending activities were recorded in five "worst case" villages. Prices paid are well in excess of those paid in areas with regularised household connections and unlimited access to water. They also show a large variation from village to village and from vendor to vendor within the same village. The range of prices encountered varied from R0.25 for 25 l (R10 per m^3) in MP Stream C to R2.50 per 25 l (R100 per m^3) in Mabharule, with prices around R0.20 to R0.50 per 25 l (R8 to R20 per m^3) being the norm in most villages where vending activities were recorded.

In "best-case" villages most households obtain water free of charge, which often involves making unauthorised connections to main pipes running through the village. Although in some areas households request permission to connect to the network, in most places connections are not regulated and are performed when the need arises. Households buy the materials and contract local plumbers or make the connections themselves. In Xanthia and M&B some households indicated that the cost of making a connection varies from R180 to R400, including material and labour costs.

The second assumption that needs to be revised is that poor people cannot pay for water. Whereas low affordability is a reality for many rural households, evidence shows that it is likely that the poorest people in Bushbuckridge area are facing the highest prices for water. The R8 to R20 per m^3 paid to water vendors in the area are one order of magnitude higher than the prices per m^3 in declared townships and neighboring towns. Moreover, some vendors do not deliver the water on site (Violetbank and Township), and people have to walk long distances to the source. Furthermore, prices for domestic water in some of the Bushbuckridge villages are well in excess of prices paid in some of the richest fully serviced households in the country. For instance, in areas such as Greater Hermanus, tariffs consist of a monthly connection fee of R40 per month and a water usage tariff (excluding VAT) starting at the very low level of R0.30 per m^3 for the first 5 m^3 and gradually increase in 10 steps to R10 per m^3.

Nevertheless, the issue of affordability needs to be separated from that of having to pay and how much. They are two different issues and the evidence showing that poor people can, and do, pay for water

[15] A new groundbreaking policy of free basic water and sanitation services has been recently introduced in South Africa. This means that everybody in South Africa has a right to a basic amount of water and a basic sanitation service that is affordable. With this right comes a responsibility – not to abuse the right to free basic services and to pay for services where these are provided over and above a basic amount. (see DWAF,2002)

should not imply that the priority for the sector is to make poor people pay for water. The fact that rural people are paying the highest prices for water indicates that there is room for manoeuvre. In some cases, where the need for payment for water is justified, implementing a formal payment system, with tariffs reflecting local conditions and choice of level of supply, can improve the situation of the poorest (some degree of cross subsidization is possible).

5.5 Conclusions, lessons and policy implications

This section discusses in detail the main lessons learnt from the research and highlights some relevant policy issues. This research has tried to contribute to raising the profile of the productive uses for water in rural areas in an attempt to bridge the information gap about these activities and to show their poverty reduction and livelihood support potential in a context of vulnerable livelihood systems. It also demonstrates that a full understanding of the relationship between water management and poverty reduction cannot be captured by conventional approaches to water supply systems. Domestic supply provision is premised on the assumption that the main issue is health and hygiene within the household. Conversely, discussion of productive uses of water by poor people tends to focus almost exclusively, in rural areas, on agriculture. Yet the key role of water in poverty reduction and livelihoods development for many poor people (and especially those with limited access to agricultural land) lies in opportunities for water-dependent production within the household.

The research shows the high potential benefits that may be locked in the relatively small quantities of water that allow the productive uses to happen. An additional 17 l per capita per day can result in an increase of approximately 14%in current personal income in the area. This requires a basic re-think of how we view basic needs and domestic water, as well as the types of poverty-focused water programmes that are developed.

A number of other specific policy conclusions can be drawn from the case study. They are:

- For the Bushbuckridge area, there is enough evidence to conclude that 25 l/p/d is about the right amount required to meet basic human needs for health and hygiene purposes.
- Water-based activities play an important role in rural livelihood systems in Bushbuckridge. The inability to access domestic water for economic purposes can reduce considerably the livelihood options for poor people in the area.
- Recovering the cost of water services is necessary to ensure the financial sustainability of service providers, and therefore, their ability to continue the service provision into the future. The ability to pay, in turn, can only be enhanced by promoting income-generating activities and increasing the economic opportunities of the rural poor. Accessing water over and above the basic needs may be a necessary condition for this.
- The rural water sector policy should not only be driven by the supply of “basic needs” but also by the economic opportunities that the access to additional water can generate in rural areas. The allocation of water for these livelihood activities should be a key element of the on-going development of water service plans and catchment management approaches, and in the development of water supply infrastructure. DWAF has recognised the importance of water for small-scale livelihood activities (see the new draft White Paper on Water Services. DWAF, 2002), but there still remain uncertainties over how these needs will be met, both in terms of the allocation of water for these uses and, even more, the awareness of service providers to provide infrastructure for these critical needs.
- Also, for the organisations involved in the rural water sector, there is a need to shift the focus and approach in project design and implementation to include productive uses of domestic water from an early stage of the intervention. This effort to better understand demand for domestic water from a broader perspective can be the key to the achievement of sustainable projects.
- Ensuring allocation of water for these water-dependent productive activities will not ensure that most households will automatically start this type of activity. Access to water is a key factor but not the only one. Impossibility to obtain finance (credit) or failure to access markets can substantially reduce the options to engage in these activities or the income stream and livelihood benefits derived from them.
- Linked to that, paying attention to the productive uses for domestic water may result in the need to re-asses the structure of the organisations involved in the water supply and sanitation sector. The complex relationship between domestic water systems and poverty reduction will need collaborative effort between specialised agencies and sector-based organisations (for example, micro credit institutions and traditional water supply and sanitation organisation) in order to approach projects in a more holistic manner and maximise the rate of success.
- Alternative ways of providing water for productive uses need to be explored. In some circumstances, providing this water through current domestic water systems may not be most effective way (see

experience with homestead gardens in Zimbabwe, in Lovell 2000). Some creative thinking will be needed from engineers and technical experts in order to provide solutions that are appropriated to the South African context.

- Finally, the provision of water for productive uses needs to be done without compromising the provision of basic needs.
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