# Self-Supply Potential in Kasungu District Context Report

## March 2015

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## Executive Summary

Pump Aid working with UNICEF under funding from the DFID Innovations Fund began work on a Self-Supply project for rural customers in Kasungu District, Malawi in May 2014. This pilot project's primary aim is to investigate market-led small business solutions to rural water poverty through research, training and mentoring of local artisans. The first phase of this project focused on research to ensure that the organisation and our partners have a greater understanding of, and a clear hypothesis about potential approaches to meet community and business Self-supply needs. To make this assessment we looked at 5 key factors which would define a good potential for self-supply in the area. These are outlined here and addressed fully in the report;

1. **There is potential for Self supply in terms of groundwater availability**

The groundwater in Kasungu is reasonably accessible. In the three target T/As over three quarters of wells were found to have water within 15 metres of the surface, even at the height of the dry season with only two wells out of 78 over 20 m deep. The average depth of already existing wells was 8.5 metres. Average rainfall in this area is below average for Malawi. In Kawambwa and Njombwa around 60% of wells do not dry up although in Kaomba this figure drops to 29%. ***This presents an opportunity for entrepreneurs who through well sinking and lining will be able to improve the reliability of these existing wells as well as being able to access groundwater at relatively low depths when digging new wells.***

2. **There is demand from rural households and/or communities to expand existing water supply provision**

Over two-thirds of well owners (72%) in the project area feel that they could cover a half or more of the cost of a household rope pump, and almost a third (31%) feel that they could cover all the cost. Those sharing wells were generally less satisfied with their supply, and almost three quarters of them (73%) were thinking about constructing their own supply. Of these 90% could correctly define the likely cost of digging, suggesting that they had actively explored the idea.

3. **There is understanding and interest from households/ communities to invest in their own supply solutions even in the context where all existing supplies are very highly (totally) subsidised.**

As said above those sharing their supply are more unsatisfied. It matters greatly to families that they can access water when they want it and without having to go any distance for it. ***The overwhelming driver for self-supply amongst existing and potential customers is convenience something subsidised community supplies often fail to fully provide.*** For example if a family of 6 want to have 27l/hd/day as per the national standard , they would have to take 7 trips both ways for water collection. In this environment only a household supply offer convenience. After taking out a wealth ranking we found the existing well owners are necessarily the very wealthy, but are those who have begun to move up from being the poorest.

4. **There are suitable and interested people to be trained to support this demand and develop the potential.**

There are a large number well diggers operate locally at village level which are affordable to the most rural families are those which. Some just dig one or two wells a year to supplement their income, or to help a family member, while others regard themselves as more professional and gain most of their income from this activity, returning to farming, being a mechanic or small trader only in bad years when harvests have been poor and so demand for wells dies off. A casual well-digger may earn 20-40,000 MK/ year, a 'professional' one 100-200,000 a year or more if he can also line the shaft. Over the past two years number of wells completed has varied by a factor of four relating to harvest incomes. This may affect the trade trained well-diggers pick up in the year of the project.

There is only one low cost pump manufacturer in Kasungu. He has a small workshop which limits the production of pumps, but can move if demand grows sufficiently. So far there has been no marketing of his products and he has only recently been able to set up a demonstration pump outside the workshop to advertise his wares, as the first stage of support from the project and of publicising his products. At present he charges approximately 60,000 MK for a pump and a further 10-20,000 MK for installation.

***Self-supply entrepreneurs already exist with the foundation skills and attitude to develop and grow businesses with the right level of training and support.***

5. **District authorities and the private sector see a benefit in self-supply which leads to them promoting the services and products available, and adopting new ones.**

As mentioned above the private sector is engaged although at a low, nascent level. District authorities have shown interest in the project so far and have engaged and offered advice to our team in Kasungu. They have taken out a number of joint field visits with us and were key data collectors in the production of this report. It will be a key role of Pump Aid to nurture this enthusiasm and disseminate tangible results from this project.

In this report we have used initial district level discussions and baseline data collection resulting in the indicative testing of these 5 hypotheses but a true test of a Self-supply model can only be made through piloting, monitoring and refining the approach. This is the aim of Phase 2 of the self supply project.

Abbreviations and acknowledgements

| | |
|---|---|
| AM | Area mechanic |
| BH | Borehole |
| CLTS | Community Led Total Sanitation |
| DHS | Demographic Health Survey |
| DWO | District Water Office |
| HH | Household |
| HIS | Integrated Household Survey |
| HP | Handpump |
| HSA | Health Surveillance Assistant |
| HWTS | Household Water treatment and Storage |
| JMP | Joint Monitoring Programme (UNICEF/WHO) |
| MDG | Millennium Development Goal |
| MEAS | Modernising extension and advisory services |
| MIWD | Ministry of Irrigation and Water Resources |
| MK | Malawi kwacha |
| MoIWR | Ministry of Irrigation and Water Resources |
| NGO | Non-government organisation |
| SSDI | Support for Service Delivery Integration |
| SW | Shallow well |
| T/A | Traditional Authority |
| UNICEF | United Nations Children's Fund |
| VSLA | Village Savings and Loans Association |
| WASH | Water, sanitation and hygiene |
| WHO | World Health Organisation |
| WP | Water point |

## ACKNOWLEDGEMENTS

All those from DWO and DHO offices, and those from the Mchinji and Kasungu offices of Pump Aid who collected all the field data. The Pump Aid team included, Hajj I. Daitoni (Lead Researcher), Fred Mtendere (Program Development Officer), Gauti Mkweza (Intern) and Robert Stroud. The team from Pump Aid Mchinji included, Zuzex Chawawa, Andrew Mandala, Kenneth Bwanali, Maxwell Namachotsa, Ireen Kubwalo, Alrington Chadzuma and Wanangwa Patsidya. Much time and essential support in planning, data collection tool development and write up was given by Sally Sutton.

Also all individuals in the villages of the three T/As who patiently answered so many questions and shared their good ideas and concerns with us.

# 1. Project context.

## 1.1 Background to the project.

Pump Aid is a UK based NGO working in the field of water, sanitation and hygiene. Since we were founded in 1998 and have served over 1.2 million people with clean water, sanitation and hygiene education in Zimbabwe, Malawi and Liberia. During this time Pump Aid's focus has been on low cost appropriate technologies and community led and marketing approaches to behaviour change.

Whilst carrying out this work, Pump Aid have become aware of the large number of smaller communities and individual households which are so dispersed that conventional community supplies do not provide a level of service which is acceptable to many of them. A communal supply is simply too far away when houses are spaced at several hundred metres. In many cases individuals have developed their own supplies to improve convenience and save time. Often these supplies are unprotected and may be prone to collapse. Building on research from other country contexts in Mali, Uganda, Zambia and Ethiopia where Self Supply was being developed and Pump Aid's own experience trialling sell supply in Zimbabwe, the concept arose to see how it is possible to establish a level of service for construction, improvement and maintenance at a cost affordable to people living in rural areas of Malawi. In this way people can free themselves of donor dependence and through incremental steps, achieve the level of service they desire. Such a level of service generally is only superseded when a piped supply brings water into the house and that for most rural people is still not likely for many years.

This approach is one which has been adopted previously in Zimbabwe and Nicaragua among others. It is now being embraced by governments and communities in Uganda, Ethiopia, Tanzania, Sierra Leone, and Mali where it forms part of national rural water and health strategies. Personal initiative to provide one's own water supply can be seen throughout the world from the most developed countries to the poorest. Of the richest, over 22% (14 million) of inhabitants of the United States depend on the self-financed water supplies, whilst of the poorest, more than 50% (6 million) people in rural Mali provide their own supplies from convenient household wells, shared with their immediate neighbours. ***No country reaches universal coverage without an element of self-provision especially among scattered and remote communities, where per capita costs of providing water become prohibitively high.*** Also for almost all economic development water is an essential element. What is lacking in developing countries is the network of skilled artisans, traders and low cost technologies to help people onto the first steps of the technology ladder. Once there, the example of their peers and the wish to continuously improve has been shown to move people on upwards. This upward movement is assisted by the greater productivity possible with a convenient supply, available on the doorstep, for both saving time in water collection and being available for small scale irrigation, food processing and animal watering. The investment pays for itself over a relatively short time through increased income.

## 1.2 National coverage in Malawi.

Malawi is one of the few sub-Saharan countries to far exceed its MDG and government targets (64% and 75% respectively) for water supply coverage in rural areas. The number served has tripled and the number unserved has halved since 1990, with the JMP recording 81.7% coverage in 2012. The

country is now reaching a stage where remaining unserved communities are the 'high hanging fruits' the places more difficult to reach and ones where per capita investment is high because of remoteness or the few houses which can be served by one centrally-positioned water point. Thus a glass ceiling is being reached, where increased investment may not lead to as large an increase in coverage as previously. This is partly because of the size of remaining unserved communities, and partly because whilst some 2.4 million rural people remain unserved, they receive less investment than the 124,000 or so urban unserved.

As a result, over the past 5 years levels of coverage have remained essentially static according to the 2012 sector review. Of those unserved, most (80%) depend on traditional wells[1]. It is in this situation that those remaining unserved, and some of those served but with an inconvenient or inadequate supply, are turning to private investment. Additionally, the functionality rates of existing hand pumps and gravity fed systems remains worryingly low. DFID has estimated this recently as 30% of boreholes and 50% of gravity fed systems not functioning at a particular time.[2]

## 1.3 National Policies and definitions.

The standard of service in rural areas is to have a water point within 500m, which 77% of rural people achieve. However beyond that it is to take less than 30 minutes in water collection a day which only applies to 54% of the population[3], and may mainly refer to smaller households where only one or two trips a day for water collection are necessary. The official norm for consumption is 27 litres per head per day, which means at least one trip per day per person in the household, so that a supply needs to be much closer than 500m from the house if collection is to take less than 30 minutes a day. Indeed for an average family of 6, the distance would need to be less than 150 metres, if the time limit and volumes for consumption hold.

As a result the Malawi Sector Innovation Plan (2013) looked at measures to maintain progress, and move towards the 98% coverage aimed for in 2025[4]. It proposes three solutions;

1) Low cost drilling and private investment (Self supply) to recoup costs
2) Increasing functionality by improved management and also private sector involvement financed by water users
3) Improved quality of water through HWTS, especially chlorination and ceramics

It is with these solutions in mind that the present UNICEF-funded project was formulated, to build entrepreneurial services for private investment (Self supply), expand area mechanics potential for income from water related services, and promote household water treatment, especially ceramic filters.

National standards cover both boreholes and shallow wells, with a design population of 250 for boreholes and 120 for shallow wells. 'An improved Water Supply Facility is one which provides a community or household with water which is considered likely to be safe to drink, free from risk of contamination, economically affordable, and reliable over a long time period. A protected shallow well with a hand pump is considered an improved water source if it has a soak away pit, apron, and a

[1] DHS Malawi 2010 and Integrated Household Survey (IHS)2011
[2] DFID Malawi Water and Sanitation Programme 2012
[3] Malawi Sector Performance Report MIWD 2012.
[4] Malawi Water Sector Investment Plan MIWD 2013.

drain, and if it is located at least 67m from the closest toilet or latrine[5]'. Whilst family well-owners may not be able to afford all the necessary protective features in one go, the aim is for them to be facilitated in achieving a high level of protection in stages, reflecting a progressive reduction in risks over time. In this way they can achieve a sustainable and convenient supply which might contribute to coverage but more importantly can materially increase their income by leaving them more productive time and also make it possible to water crops, vegetables and animals. For these reasons more and more people are opting to make their own supplies, which provide more flexibility of use than a communally owned one can. It also allows them control over an asset which is easily visible and indicates a level of disposable income and pride in, and care of, the family. Such supplies are highly prized, but potentially present a level of risk which the proposed project seeks to minimise. Their relatively low cost compared with technologies for communal supplies leads to neighbours copying each other in the same way that they do in house-proud aspects such as iron sheeted roofs, cement floors and glass windows. Status and material gain are triggers which communal supplies do not offer, and are aspects which do much to ensure sustainability.

## 1.4 Introduction to Kasungu District.

Kasungu District lies to the West of the country, towards the centre (see Fig 1.1). It is largely an area of sandy loams or loamy sands which prove fertile for several cash crops such as tobacco, soya and groundnuts. Rainfall is only about 0.8m a year except in the south-east where it reaches 12-1600mm. The lower range is generally not enough to provide a household with year-round rainwater harvesting without large, expensive storage tanks. However in the busiest season for agricultural work, during planting and weeding times, rain could be sufficient to reduce the need to go to distant sources of water, as most houses have iron sheeted roofs to collect water and rain falls every 2 out of three days. Also groundwater is widely available within 10-15m of the surface, so many households have their own wells. However lack of widespread expertise in lining wells to stabilise a shaft which may collapse, limits the areas where such sources are developed.

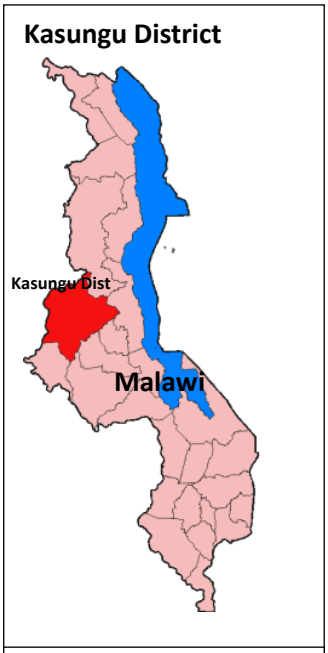
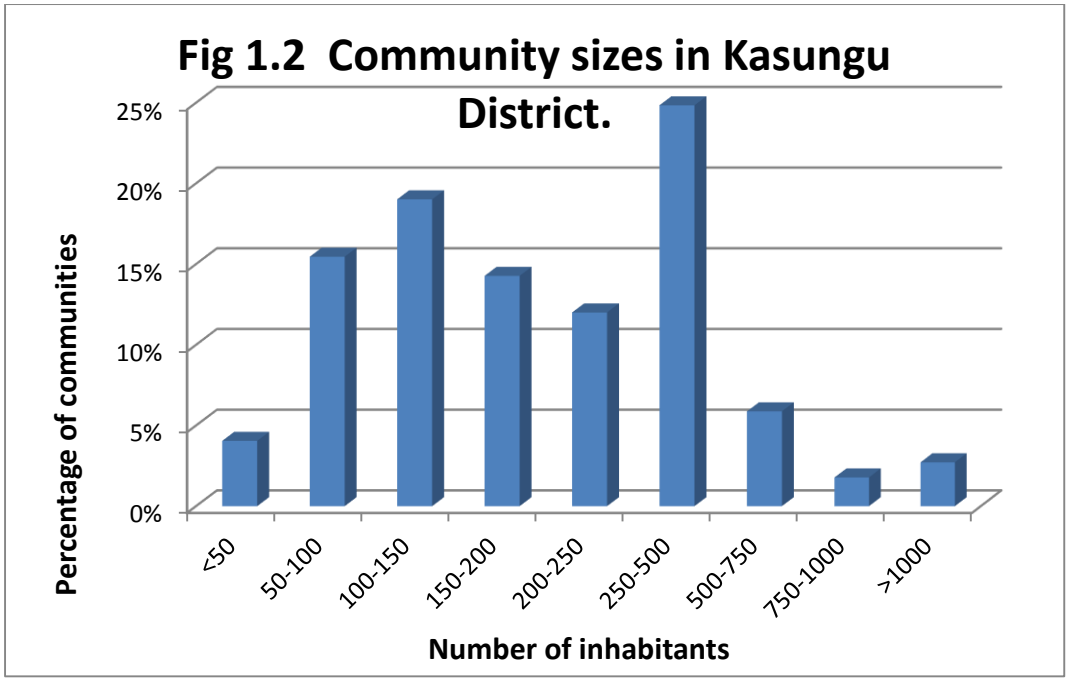



Fig 1.1 Location of Kasungu District

The overall rural population of the district is approximately 540,000, according to the UNICEF/ MoIWR inventory of water points and rural communities undertaken in 2012. Rural densities overall are around 80km$^{2}$[6] which is high for the region. Just over half of all villages are of a size of 150-500 inhabitants (see Fig 1.2), and almost 40% have populations of less than 150. Only 3% of communities have populations of over 1000. According to the 2012 WPI 491 communities have no functioning tap, borehole or shallow well and 184 have no water point at all. There is therefore a need to address the water supply problems of people in small communities especially those with scattered houses, for whom conventional rural supplies are not so well suited since many are then far from the water point. They are usually also the last to get served, since the cost per head of a conventional supply becomes very high.

[5] Whilst this distance is desirable with a high density of latrines, in areas of low density housing, smaller distances may be considered as offering no risk (see Section 3.5)

[6] Kasungu District Socio-economic profile, 2006-2009. Figures projected to 2012




The land is mostly controlled by the chiefs, but a significant part is owned by tobacco estates. As a result some 21% is estate farmed, 21% farmed by small holders and the rest being National Park or settlements and forest. Average small holding size is just under 2 ha, limiting what people can produce, especially when slash and burn techniques are used. The balance between tobacco, maize, and other cash crops varies widely, depending partly on the tobacco price the previous year and also on the availability of seed. 2013/14 saw a disastrous year for tobacco farmers, so that this year many are turning to soya and groundnuts in hopes of a more stable market. This, and their levels of debt to the tobacco companies means that predicting whether farmers will have spare cash to invest in their houses and water supplies, is very difficult.

A few farmers have invested in treadle pumps, most having been distributed for free by MPs. The high levels of NGO activity and the history of hand-outs mean that a major shift in way of thinking is needed if self- financing is to take off. However there are also over a dozen credit institutions to provide loans but some of these are at punitive rates. Four of the 12 organisations target women's groups.

Whilst Kasungu District is one of the wealthier districts in Malawi, it is also the one with the lowest coverage in rural water supply according to the DHS (2010) survey, with only some 63% of the rural population covered. Functionality runs at about 75% according to the UNICEF inventory.

On Sept 30th 2014 the Kasungu DTC allocated ten T/As within which Pump Aid might work. These were -:

**Table 1.1 The ten initially selected T/As.**

| Traditional Authorities |
|---|

| | |
|---|---|
| Chilowamatambe | Mangwazu |
| Kaomba | Mwase |
| Kaphaizi | Njombwa |
| Kawamba | Nthundwala |
| Lukwa | Santhe |

The chiefs of all ten were visited and the project introduced to them. It then became apparent that it would not be possible to operate effectively in all ten T/As and achieve the desired results within 18 months. So using a set of selection criteria that included -:

- Population
- Number per functioning water point
- Number of unprotected sources
- Interest of chief
- Activity of ADC
- Number/ quality of Area mechanics
- Number of health posts
- Area of small holder farmers

The number within which the project would work was narrowed down to three in discussion with the District Water Office (see Fig 1.3). These are **Kaomba, Kawamba and Njombwa.** These have a rural population of some 133,000, or about 50% of the population of the ten T/As originally selected. This is because they are areas with the highest population density (110-180/ km$^2$) reflecting also the quality of the soil and access to water.

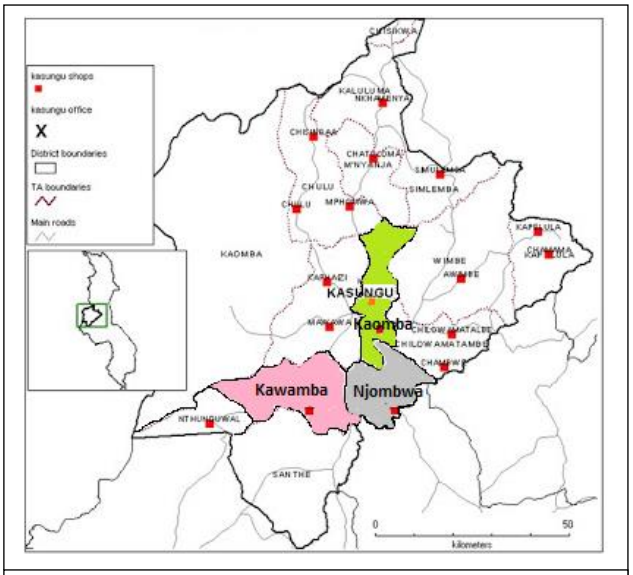



Fig 1.3 The three selected T/As

## 1.5 The three selected Traditional Authority areas.

Kaomba borders onto Kasungu town, so has some peri-urban areas, but the other two are essentially rural. Their basic characteristics are presented in Table 2. Kaomba appears to have a high number of people per hand pump because a sizeable proportion of the population are served by taps. This peri-urban location also leads to a higher than average population density. However such a situation gives the opportunity to develop Self-supply strategies for those on the (often unreliable) periphery of piped supply systems, who tend to be early adopters of new ideas, and often have access to higher disposable incomes than remoter rural dwellers.

**Table 1.3. Population and population density (2012)**

| **Traditional authority** | Population | Households | People/hhold | Area $Km^2$ | Pop Density |
|---|---|---|---|---|---|
| Kaomba | 50111 | 9101 | 5.5 | 303 | 165.4 |
| Kawamba | 37240 | 7691 | 4.8 | 583 | 63.9 |
| Njombwa | 50677 | 9318 | 5.4 | 308 | 164.5 |
| Totals | 138028 | 26110 | 15.8 | 1194 | |

**Data from MOIWD/ UNICEF WP inventory 2012**

**Table 1.4. Available water supplies (2012)**

| | | | | | | | | %age of functioning WPs | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Traditional authority** | **Total BH** | **Func BH** | **Total SW** | **Func SW** | **Taps** | Trad wells | **People/HP** | **%age f BH** | **%age func SW** | **%age func taps** |
| Kaomba | 93 | 83 | 175 | 157 | 971 | 748 | 208.8 | 89% | 90% | 98% |
| Kawamba | 74 | 62 | 248 | 236 | 9 | 483 | 125.0 | 84% | 95% | 0% |
| Njombwa | 94 | 83 | 201 | 181 | 16 | 971 | 192.0 | 88% | 90% | 100% |
| Totals | 261 | 228 | 624 | 574 | 996 | 2202 | | | | |

Not only is the coverage high, but the proportion of water points which were found functioning was also high, suggesting an effective and sustainable system. The number of wells and boreholes appears to have more than doubled since the WPI of 2006. Despite the good provision of communal water supplies, it seems that many people are sufficiently far from these water points to want to create a more convenient supply for themselves. The number of local traditional wells identified in the 2012 WPI is almost twice the number of wells or boreholes with hand pumps (see Table 1.4). The survey which is reported on here is designed to look at these sources in more detail, to look at whether people still use them and are constructing new ones, and whether owners and users could be persuaded to up-grade them to provide a safer supply.

In terms of extension and development civic society bodies, each of the three have a good basis for getting messages to household level.

**Table 1.5 Some of the Resources for community mobilisation in the three T/As**

| T/A | Community development groups | Health posts | CBOs | ADCs |
|---|---|---|---|---|
| Kaomba | 18 | 22 | 15 | 50 |
| Kawamba | 12 | 6 | 2 | 28 |
| Njombwa | 13 | 10 | 2 | 18 |

Source Kasungu Socio-economic profile 2007

Kasungu District is well supplied with NGO support for development activities to supplement government support. The three T/As are no exception (see Table 1.6).

Table 1.6 Non- Governmental Organisation in T/As Njombwa, Kawamba and Kaomba.

| T/A | NAME OF NGO | ACTIVITIES |
|---|---|---|
| **Kaomba** | 1. Care Malawi | • Education ( sponsorship, construction, leaning and teachings materials<br>• Economic empowerment (VSLA)<br>• Agriculture<br>• Nutrition for pregnant women, lactating mothers + U/5s<br>• Health (SSDI) |
| | 2. Centre for Youth and Children Advocacy | • Rights of children |
| | 3. National Smallholder Farmers' Association of Malawi (NASFAM) | • Food security<br>• Promotion of soya beans and groundnut farming<br>• Promotion of tobacco farming |
| | 4. Microloan Foundation | • Business and farm inputs loans. |
| **Kawamba** | 1. Care Malawi | • Education ( sponsorship, construction, leaning and teachings materials<br>• Economic empowerment (VSLA)<br>• Agriculture<br>• Nutrition for pregnant women, lactating mothers and U/ five.<br>• Health (SSDI) |
| | 2. National Smallholder Farmers' Association of Malawi (NASFAM) | • Food security<br>• Promotion of soya beans and groundnut farming<br>• Promotion of tobacco farming |
| | 3. Concern Universal (CU) | • Water and Sanitation project. ( rehabilitation and drilling of bore holes and sanitation) |
| | 4. Nkhoma Relief and Development | • Water project ( installation of MK 5 pumps) |
| | 5. Inter Aide | • Water project ( rehabilitation of Afridev and Malda pumps) |
| **Njombwa** | 1. Care Malawi | • Education ( sponsorship, construction, leaning and teachings materials<br>• Economic empowerment (VSLA)<br>• Agriculture<br>• Nutrition for pregnant women, lactating mothers and U/ five.<br>• Health (SSDI) |
| | 2. Nkhoma Relief and Development | • Water project ( installation of MK 5 pumps) |
| | 3. National Initiative for Civic Education (NICE) | • Civic education in gender, food security, environmental management ) |
| | 4. Centre for Youth and Children Advocacy | • Rights of children |
| | 5. Inter Aide | • Water project ( rehabilitation of Afridev and Malda pumps), training of AMs |

## 1.6 Challenges

- Malawi as a whole has high provision of public water. Interest to invest may be lower than in other East African countries, as people look towards government for water provision.
- Almost half of agricultural land is tenanted which deters investment by households in fixed assets (such as houses and wells). Much would depend on the interest of estate management.
- The rural people of this district have a high level of dependence on NGO and estate giving / interventions.
- The level of debt to tobacco companies limits farmers' abilities to invest.

## 1.7 Opportunities

- The sector review (2012) identified Self supply as one possible solution to maintaining progress in coverage.
- Kasungu is one of the wealthiest districts in the country but also has one of the lowest water coverage. Potential to invest and need for more water points make it an appropriate district in which to explore the model
- A significant number of traditional wells exist already which indicate demand to improve the situation and offer opportunities for up-grading.
- Community members are travelling significant distances to communal wells and are expressing a desire for convenience.
- The district has almost 800 communities with less than 150 people, and over half of these have no functioning water point. Other options are required / desired.
- The influence of the Chiefs can lead to good progress if they support the idea, and those in the selected T/As have responded positively.
- Estate management have identified water supply as an essential aspect for the well-being of tenants and have provided some with rope pumps. There is an opportunity to discuss putting money into long-term support rather than short term gifts.

## 1.8 Conclusions

- There are indications at national, district and T/A level that there is potential for Self supply and also need for new options to serve scattered households and the smaller communities.
- The selected T/As are very suitable for piloted introduction of a new approach because of the distances travelled to communal wells, desire for convenience and the 'relative wealth' of community members.
- Significant numbers of people have already invested in their own traditional supplies.

# 2. Study on traditional water supplies in three T/As.

## 2.1 Research hypotheses

The research element of this project is designed to test certain hypotheses through data collection and piloting. Questions asked during surveys and explanation of survey purpose to respondents and village headmen also play a role in sensitising people to the issues which arise in adopting Self-supply as one strategy to achieve universal coverage, and the potential for increasing economic and social benefits from water. This report summarises the findings of the field survey which was designed to explore the operating context for Self supply in Kasungu District.

Hypotheses tested include:-

- There is potential for Self supply in terms of groundwater availability.
- There is demand from rural households and/or communities to expand existing water supply provision
- There is understanding and interest from households/ communities to invest in their own supply solutions even in the context where all existing supplies are very highly (totally) subsidised.
- There are suitable and interested people to be trained to support this demand and develop the potential.
- District authorities and the private sector see a benefit in self supply which leads to them promoting the services and products available, and adopting new ones.

Indicative testing of these hypotheses, and development of approaches can be achieved from initial district level discussions and baseline data collection, but a true test of a Self-supply model can only be made through piloting.

## 2.2 Research protocol.

### *2.2.1 Aims and objectives*

The main objectives are -:

- Establishing **the opportunities for Self Supply** in the region (testing the hypotheses)
- Identifying **key issues for accelerating effective household investment**
- Defining **main challenges to adoption** and whether /how these can be overcome
- Definition of **baseline situation in target areas**

#### *i. Research design*

The structure for data collection is outlined in Figure 2.1. It consists of data collection at Area, community, and household levels and from key informants. Data was collected from Dec 14-19 in Njombwa, and from Kawamba and Kaomba in 5-16 January 2015. Field surveys were carried out by Pump Aid staff members assisted by those district level personnel who formed part of the team on the initial visits to T/A headmen and extension workers. Data entry was carried out by Pump Aid. Whilst target numbers were reached, a significant number (15%) of conventional community wells (boreholes/lined shallow wells with hand pump) were included but were not self-funded. For much of the analysis these have been excluded but are useful for comparison.

No water quality data has been collected during this survey, but much invaluable information has been gathered through previous monitoring surveys on water quality done by Mzuzu University[7] and by Brighton University for UNICEF[8]. Some of those findings are referred to in this report.

[7] Functionality and Water Quality of Elephant Pumps in Malawi (2013) Mzuzu University

[8] Assessment of Drinking Water Quality for Low-cost Water options in Rural Malawi. Final report Nov 2012 University of Brighton and University of Malawi.

## Figure 2.1. Detailed Study structure for 3 T/As

Target numbers/ actual numbers

## A 1 + 2, Water supply survey

**A1 Water supply structure** — 100 /96 sources

- Definition – level of protection
- Condition
- Sanitary inspection

**A2 Water supply information** — 100/96 sources

- Reliability
- Brief history (Cl, age, etc)
- Costs of construction and improvement
- Uses and users
- Ownership/ sharing of well

**A Guideline on types to target**

- Unprotected well/Unprotected spring

**A Pre-requisites for data types**

Quick to carry out, mostly by observation. Information needed is basic and should be available from any user found at the site.

## B. Household characteristics.

**B Household supply characteristics (general)** — 150/157

- Size of household
- Wealth ranking
- Position in community
- Water consumption/ sources/ uses
- Water treatment /storage practices
- Attitudes to supply – satisfaction level, drinking and other uses
- Changes they would like to make (M/F) HH and communal
- Available/ used financing mechanisms
- Nearest alternative source type/distance, when used, for what
- From whom, where do they get advice/ information?

**B2 Well owners (communal or individual)** — 100/97

- Reasons for construction
- Benefits/ problems from having well
- How much spent, who contributed?
- Who constructed/ improved well, where are they from?
- Satisfaction/ demand for change/ reasons
- Willingness to pay, barriers to change

**B3 Non-well owners** — 50/59

- Distance to nearest water sources
- What source do they use for what purpose?
- Do they pay anything for taking water from source used
- Satisfaction with water supply provision? Reasons
- Would they invest in their own well?
- Barriers to change in situation

## C. Community profile

**C. Community profile (VDC group/ member)**

- Size of community (numbers, HHs)
- Available water sources, distances, types, functioning/reliability,
- Perceived w/s problems and solutions
- Any previous community efforts/ contributions
- Skills within community and available – masons, well diggers, carpenters etc
- Known support services public and private
- Equity/inequity issues, attitudes to sharing
- Gaps in knowledge
- Perceived constraints to development
- Community/ individual successes /plans

**C. Guidelines on target communities.**

- Focus on communities with inadequate protected supply
- Also those smaller than 150 inhabitants and isolated farms/ those with unprotected wells

## D. Key informants

**D1 .HSA** — 6/7

- Catchment area and population
- Approximate number and type of sources
- Functioning/ problems of sources/ DDI/ cholera
- Numbers using handpumps
- Demand for traditional wells/ improvements,+ potential to develop
- Roles and responsibilities now and potentially with self supply

**D2 Area mechanics** — 6/7

- Number of supplies they cover/ income
- Experience of willingness to pay
- Attitude to / knowledge of other supplies
- Assessment of potential for T well up-grading, improving
- Interest in promoting Self supply,

**D3 Low cost Well diggers** — 6/4

- Capacity/ income/ prices /experience in well lining etc
- Limitations to business, area covered
- Training needs /demands

**D4. Additional key informants may** include, church/ mosque elders, traders,, other active extensions workers /members of the ADC

# 3. Traditional wells in Kasungu- their physical characteristics.

## 3.1 General features

Traditional wells in Kasungu District are typically shallow and with very limited protection of the well head against contamination from wind-blown and water- borne debris/ contaminants. They are typical of the several millions of such wells found all over Africa, which offer a convenient, but not necessarily reliable or perfectly safe supply. The survey looked at the levels of protection of such wells and their reliability, with a view to establishing the potential for improving well performance in terms of water quality, adequacy and reliability.

## 3.2 Depths to water.

In general the groundwater in Kasungu is reasonably accessible. In the three target T/As over three quarters of wells were found to have water within 15 metres of the surface, even at the height of the dry season. Only two wells out of 78 were over 20 m deep, and the average depth was some 8.5 metres. Average depth to water in the dry season was 7 metres. Well diggers interviewed said that they were generally not keen to dig more than 15-20 metres because they had no safety equipment, were worried about air circulation, and often encountered rock below this depth. Groundwater was particularly shallow in some areas of Kawamba and Kaomba TAs.

Water levels in 82% of wells were more than 5 metres from the surface, at which depth it is very unusual for there to be aquifer contamination from latrines, even when they are nearby (see also Section 3.5). The filtering through unsaturated ground is particularly effective as there is little lateral dispersion. The seasonal fluctuation in water levels has not been ascertained, but the seasonal reliability over the past five years has.

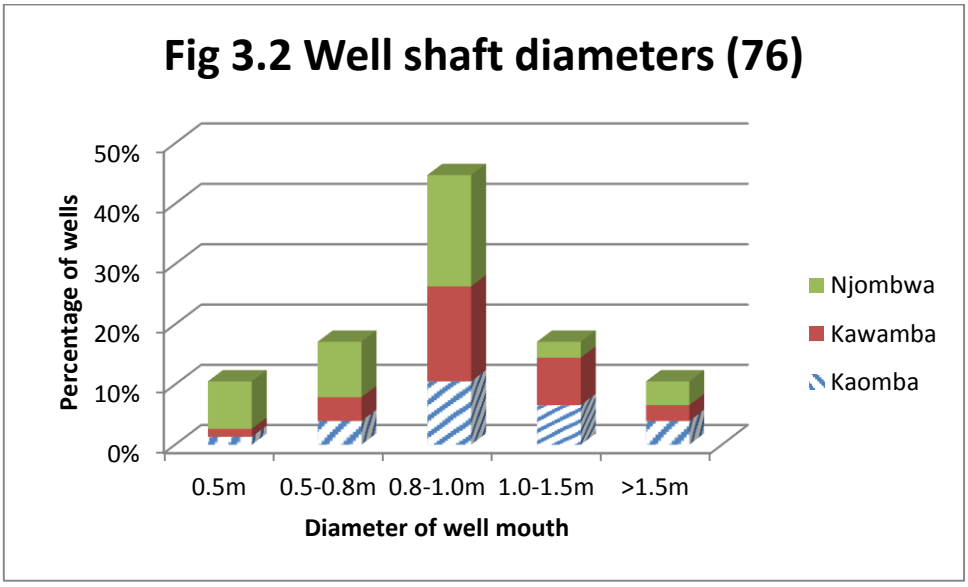
During the dry season the depth of water in the well is at its lowest, and a third of wells were found to have less than half a metre of water in them. In this case the drawing of water by bucket can stir up dirt from the bottom, and any contamination on the bucket is not so effectively diluted. The need for well-deepening is also highlighted in user perceptions of changes needed (see Section 4.10 and Fig 3.13). However, almost half had more than a metre of water even at the end of the dry season of 2014.

## 3.3 Well diameter and lining

Fig 3.1 Njombwa well diggers tend to excavate at smaller diameters

There is no strong tradition of lining wells in the area, and some well diggers therefore dig a shaft of as small a diameter as possible (see Fig 3.1), since the smaller the diameter the more stable the shaft and the less material to be removed. However wells of this small a diameter have to be reamed wider if they are to be lined. Older wells in which the top of the well may have crumbled away with the withdrawal of water, tend to be wider as do those for which lining is planned, or the well-digger prefers to operate with more space around him.

Figure 3.2 shows that the practice in Njombwa would appear to favour smaller diameters and therefore lining of wells may be more expensive as they will need widening. It is not known if this feature is purely the preference of the local well digger or whether the ground conditions make this the best alternative.




There is a growing realisation of the value of lining wells but at present the survey shows that two thirds are unlined. Most of the rest (22%) are lined at the top to stabilise the area around the well mouth, where seepage can cause collapse. Only 5% are lined at the bottom to reduce collapse below the water table. 10% are fully lined and this is mainly with bricks, usually without mortar, but those lined at the top may be with bricks and mortar, reducing the risks of seepage back into the well. Five wells are said to be lined with concrete rings, (four in Njombwa and one in Kawamba). Four are only top-lined and one is said to be fully lined with concrete rings (Njombwa 002-012) and is privately owned, but used by the community.

Brick lining may be part of the skill of a well digger but equally may be undertaken by a mason specialising in lining with or without mortar. Wells need to be more than 0.8 m diameter to be lined without widening. Whilst the brick lining stabilises the shaft walls it also makes it more difficult and expensive to deepen the well as the bricks must be removed before further digging, and then re-inserted. Concrete rings, however, can be left in place unless their diameter is too small for anyone to excavate below them, allowing the ring to move downwards.

## 3.4 Wellhead protection.

Wellhead protection includes -:

**Table 3.1 Elements of protection**

| Element | Purpose | Materials/ product |
|---|---|---|
| Parapet/ top lining | Keeps water from flowing back into the well/ Stops seepage of infiltrated water back into the well | Brick and mortar, oil drum, timber, concrete ring |
| Apron | Diverts spilled water away from well mouth | Domed Compacted clay, brick/ screed covered brick, concrete |
| Cover | Keeps windblown dirt out of the well, | Wood, metal |

| | | |
|---|---|---|
| | and stops children/ animals falling in | |
| Drainage channel/ lipped apron | Disposes of water from apron, if apron has a lip to divert water to lowest point. | Brick/mortar, concrete, wood. |
| Water lifting device | Various levels of reduced contamination from dirt on rope or hands | Bucket and rope, pulley or windlass, rope pump, piston pump. |

The survey suggests that awareness of the need to keep dirty water and debris out of the well is recognised and acted upon by just over half of well owners/users. At some 56% of wells the mouth of the well is raised above ground level. However this means that many wells could make quite small changes at no cost, which would improve protection of water quality.

Fig 3.3 Family traditional well, with low parapet of mud bricks and timber to slightly reduce debris falling in and to make drawing water easier. (Njombwa)

A third of those with a raised surround simply depend on the protection provided by the earth mounded up around the mouth during excavation, but the rest have either a shallow brick ring ( as in Fig 3.3) or a more solid brick wall (30% ). The more solid wall usually penetrates a short distance below ground level, whilst the shallow ring is just bedded onto the ground surface. There is no use of car tyres, timber shuttering or wheel hubs as in other parts of East Africa.

In standard wellheads the parapet is joined to an apron to ensure that no water can infiltrate into the shaft wall and cause it to collapse. 70% of the surveyed wells have no apron, or simply bricks to reduce the accumulation of mud around the well. A few have compacted clay which is usually no more than the waste material from excavation used to build up around the mouth, but 19% have a concrete / brick and mortar apron (see fig 3.4). This may be more to provide somewhere clean to stand the bucket on, or to stand on to draw water. However it indicates owner's interest and ability to buy cement and improve the wellhead.

Fig 3.4 Traditional well with parapet, incomplete apron and cover, but no drainage channel.

More than half of wells are left open with no cover at all, and it is not usual to find wells with a lockable lid, which can keep both blown dirt and animals out. Producing simple frames and lockable lids which can be set on the top of the parapet (see Fig 3.5) would be an effective improvement and one which well-diggers/ masons or the Interaide WASH shop and associated traders could sell.

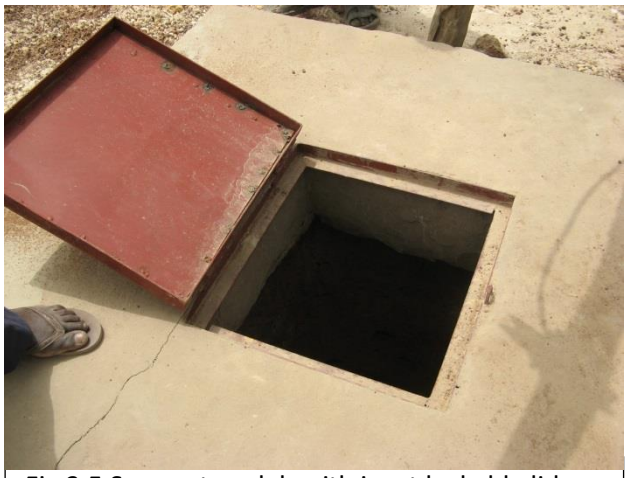


Fig 3.5 Square top slab with inset lockable lid.

At some 17% of sources there had been an effort made to divert spilt or standing water away from the well, with a dug channel. More permanent brick or concrete channels were not found, probably because of the design of the aprons. Without a raised outer edge to the apron, water is not guided into a channel. This can be done quite simply with bricks and stops the area around the well becoming muddy and providing unpleasant access.

Almost all (98%) of wells had no lifting device for water other than a bucket and rope. One had a pulley and one had a windlass . Both these are low cost steps to improve ease of lifting and also to reduce contamination, which could be promoted alongside rope pumps and higher, more expensive technologies. No family wells with rope pumps were visited, but there has been a project by the tobacco estates to provide them for free to some of their farmers.

Overall well head protection is not highly developed and there is plenty of scope to encourage people to make low cost improvements to make water lifting easier and water quality better.

## 3.5 Well siting

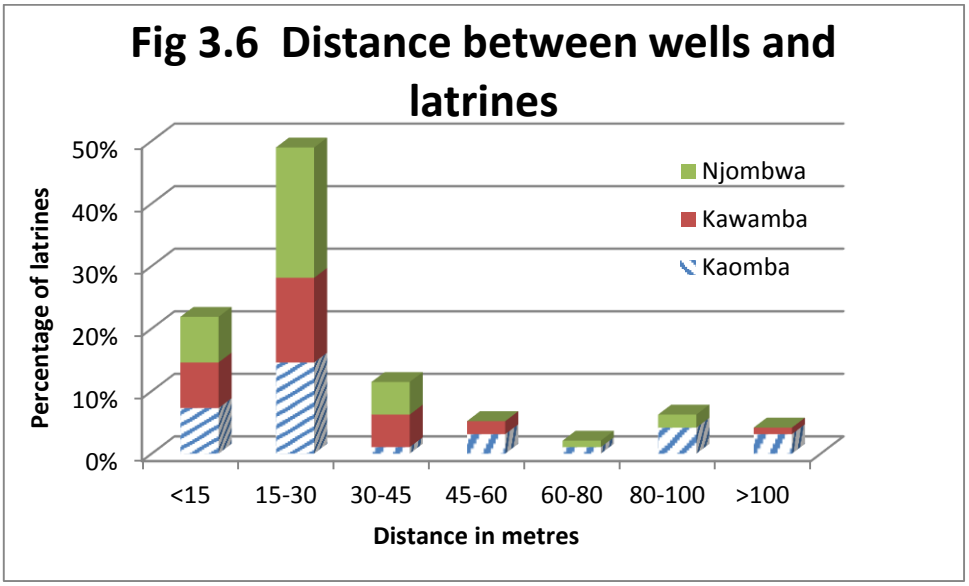
Well diggers often site wells by looking at topography, vegetation and the convenience of the customer in having water near to the house. Additional aspects include avoiding digging a well near a source of pollution. This would include latrines, kraals and tanneries.

Only a small proportion of wells (10%) are dug at sites where surface water would naturally flow towards the well mouth over a sizeable catchment, but of these almost all are without any raised surround or parapet to stop water flowing in. Being at a low point topographically they are also the wells which are of below average depth to water (4.7m instead of 6.9m), and so more prone to contamination from infiltration of dirty water. The users of such wells should be a high priority in creating an awareness of risks and measures which can be taken to reduce them.

It is also apparent that few people are aware of the risks of siting wells too near to latrines, and that well-diggers and health extensions workers need to be informed and encouraged consider this aspect in the siting of wells. The Malawi national guidelines in the National Investment Plan[9] require a well to be 67m from the nearest latrine. The 2005 National Standards[10] for shallow wells and boreholes set a minimum distance of 100m to latrines, kraals and dip tanks. This is the standard for community wells, rather than for private use. It is necessary to ensure that there is no risk of contamination, but at the same time to make the supply as convenient as possible. In rural areas it is not possible for a single latrine to contaminate a well at 100m, and highly improbable at 60m. Acceptable distance to a latrine is much debated and there is a need for more water quality data. We would suggest that until that is available, 30 metres in granular aquifers and all except those

[9] MAIWD Water sector Investment Plan 2013.
[10] Borehole and Shallow Well Water Quality Specification 2005. Malawi Bureau of Standards

with cavernous fissures, be regarded as a guideline. This is the distance recommended by WHO[11] and the EHP review[12] of pit latrines and their impact on groundwater suggests 15-30m, with 15 m being acceptable in weathered crystalline basement layer, and fine granular sediments. The base of latrine pits should be at least 1.5-2m above the water table, and generally wells are level with, or on higher ground (75-89%) than the surrounding area where latrines are sited.




The distances surveyed for this study suggest that 20% of wells are within 15m of a latrine, and 71% within 30 metres. The conflict between wanting convenience both for sanitation and for water is something which needs to be discussed carefully with households to highlight the risks and make sure they prioritise proximity for one or other depending on their views of which needs to be closest to them.

## 3.6 Reliability of supply.

In order to avoid linking performance to one good year, users were asked to say whether the well had dried up in the past five years. Intra-annual rainfall is highly variable in Malawi, and Kasungu has an average from 1981-2011 of 784mm, with a ten year cycle of drought and plenty[13] relating to the movement of the ITCZ and el Nino. Thus rainfall in this area is below average for Malawi as a whole. From the data available it seems that reliability is similar in Kawambwa and Njombwa, where almost 60% of wells do not dry up. In Kaomba however wells are much more likely to dry up with less than a third (29%) providing a reliable year-round supply. In offering particular services relating to well deepening, this needs to be borne in mind.

## 3.7 Adequacy of supply

A similar pattern is apparent when looking at the adequacy of supplies. Half or more than half of wells in Kawambwa and Njombwa have adequate water for all users, throughout the year.

[11] WHO Fact Sheet 3.4 www.who.int/water_sanitation_health/hygiene/emergencies/fs3_4.pdf and WHO Sanitary inspection form www.who.int/water_sanitation_health/hygiene/emergencies/fs2_1.pdf

[12] EHP Review. Graham J, and Polizzotto M.L 2013 Pit ltraines and their impacts on groundwater quality: A systematic review. http://ehp.niehs.nih.gov/1206028/

[13] CP Kumboyo, Yasuda H, Kitamura Y and Shimizu K. 2014. Fluctuations of rainfall time series in Malawi. An alanysis of selected areas.. Accepted manuscript. Geofizika. 2014

| Table 3.2 . Adequacy of supply | | | |
|---|---|---|---|
| | Kaomba (21) | Kawamba (24) | Njombwa (33) |
| Always | 29% | 50% | 55% |
| Part of year | 52% | 33% | 27% |
| Never | 19% | 17% | 18% |

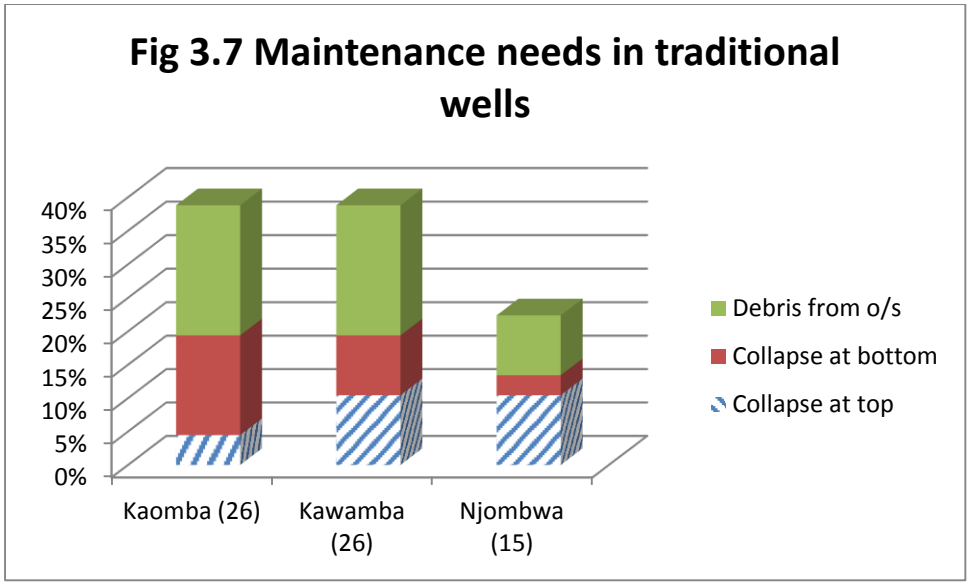
Kaomba tended to have more wells with seasonal supply and all three T/As tended to have similar proportions of wells which never had enough water for users. Of these supplies three quarters served more than average numbers of users, so that the problem is perhaps less the supply than the pressure of people using the source. In these cases the solution is probably more in sinking additional wells than in deepening existing ones.

## 3.8 Well maintenance and improvement

All traditional wells have been excavated without access to de-watering equipment. As far as possible they are dug during the period of lowest water levels, but with the large annual fluctuations in rainfall, it is usually necessary to re-deepen wells in years of below average rainfall and to follow water levels down as they fall seasonally or progressively over the years. Two-thirds of wells in Kaomba have been deepened since they were first dug, and even more in Kawamba (75%) and Njombwa (69%). However in the case of Kaomba almost two-thirds of wells have dried again since re-deepening, whilst a half or less than half have done so in Kawambwa (50%) and Njombwa (41%). This suggests that the well-diggers in the last two T/As may be more expert at deepening, or that well owners have pushed them to go deeper when they return to the site.

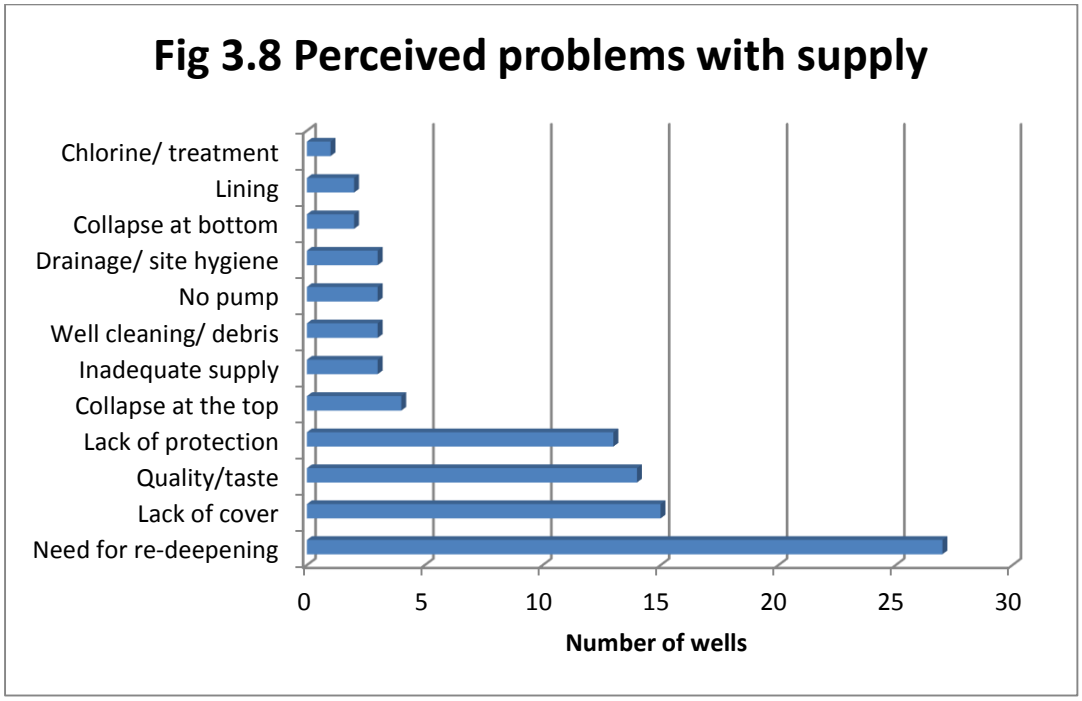
Whilst there have been major efforts to re-deepen wells, there is also a need for clearing out the debris that accumulates in wells as a result of operation and of minor collapses at the bottom or top of the well. Such cleaning out is a regular outlay in terms of labour or cash for most well-owners or users. On average only 8% of wells are not cleaned out at all, and most of these are in Kaomba. All wells in Kawamba were cleaned out at some time, with 84% being cleared of debris once a year or more often. This regular care of the supply is a combined function of having direct ownership and responsibility and also direct contact with those who dug the well. In all three TAs around three-quarters of all wells are cleaned on an annual or more frequent basis. Improving wellhead protection would save considerable outlay on cleaning.

The prime reasons for cleaning out the debris that accumulates in the well differs from place to place (see Fig. 3.7) In Kaomba and Kawamba half of all wells are cleaned out to remove debris from outside the well. This is sometimes old buckets which have fallen in when the rope breaks, but also what falls in where wells are uncovered and where water and associated flotsam can flow in. Njombwa seems to have least problems with the need for well cleaning, but wells appear to have more problems from collapsing at the top of the well, and Kaomba from instability at the bottom of the well. Kawamba has almost equal problems from both. In all cases it seems that about 50% of wells have a problem from collapse which requires regular payment or effort from users/ owners which could be avoided if lining were installed. This is a powerful selling point for well-lining, and being able to recoup the added expenditure in a reasonable period of time.




## 3.9 Problems arising for traditional wells .

At source level, most perceived problems of the supply relate to wells drying up or having so little water that it is of poor quality See Fig 3.8. There is a high awareness of the need for better protection of the supply.




## 3.10 Environmental hygiene and sanitary inspection.

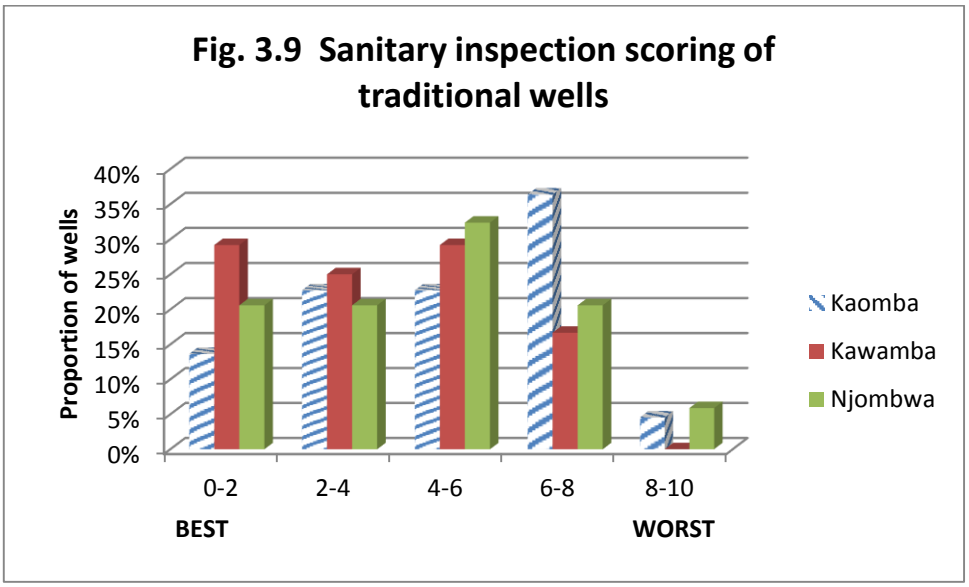
Especially when protective measures are poor, the way that the surroundings of the well are kept and the practices during the drawing of water, can have a major impact on water quality. Potential impact can in part be assessed by standard sanitary inspection, but this tends to indicate higher than actual risks as the parameters measured are more relevant to conventional community supplies.

For each of the aspects below, a 'yes' answer denotes increased risk, so the higher the score out of ten, the higher the probability that water quality is poor.

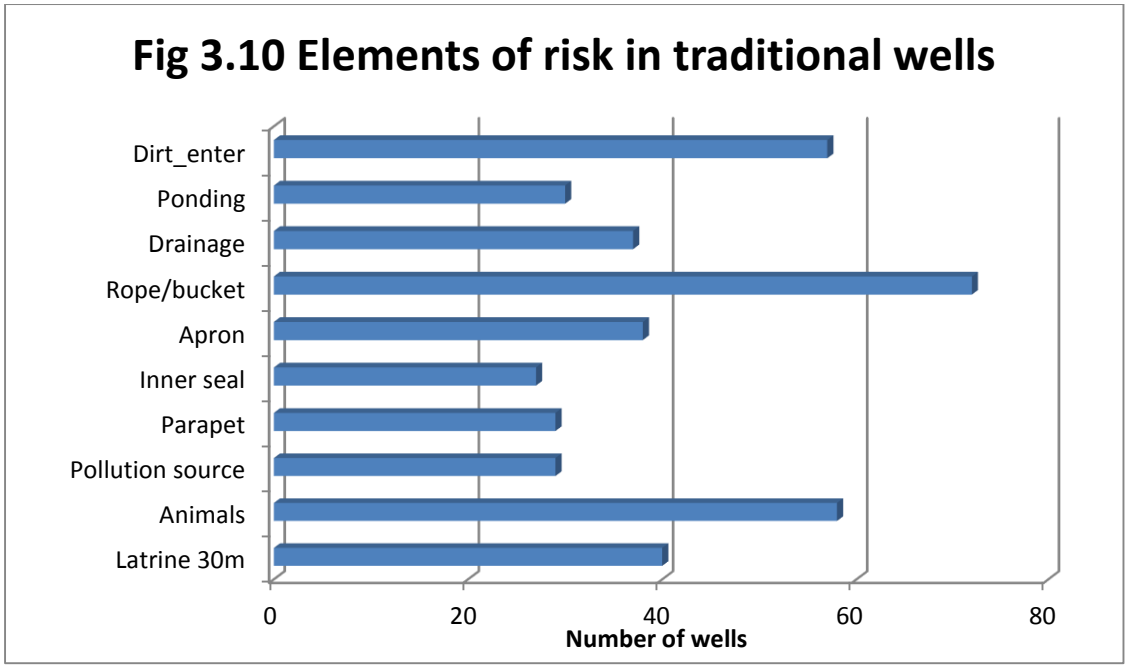
**Table 3.3 Elements of sanitary inspection**

| Item |
|---|
| Latrine within 30m* |
| Animals can roam around the wellhead |
| Sources of pollution within 10 metres (also recorded for 30m) |
| Parapet missing or damaged or <0,75m high |
| Inner seal extends less than 1m below ground level |
| Apron damaged or less than 1m wide |
| Rope and bucket is used. |
| Drainage channel absent or blocked/damaged |
| Water ponds around the wellhead. |
| Can water, dirt or dust enter the well? |

In terms of overall score, few wells seem to fall into the worst category (8-10) and in the other categories wells are fairly equally distributed between them (see fig 3.9). It would seem that Kaomba is likely to suffer poorest water quality, with almost twice as many wells in the moderate risk category of 6-8.




Of the risks that contribute to these scores it would seem that the commonest (see Fig 3.9) are the use of the rope and bucket, the ease with which dirt and run-off can enter the well, and the signs that animals can roam around the water point.




90% of wells have one bucket which is used by everyone. It is sometimes thought that this is cleaner than everyone bringing their own. However much depends on the way buckets are stored. People who take their buckets away with them tend to store them in their house, but when a bucket is for everyone's use it needs to be accessible, and is often left lying on the ground. However in Kasungu, at the surveyed wells less than half left the bucket on the ground. A third put the bucket in the well (see fig 3.11 and 3.12 ) which stops the rope picking up dirt, or hung it on a post, whilst a quarter stored it in the house.

Using a pulley reduces the contamination of the rope, and makes it easier to store the bucket and rope in the well, but only two wells had this arrangement.

Fig 3.11. Rope stored on a post to keep it out of the dirt

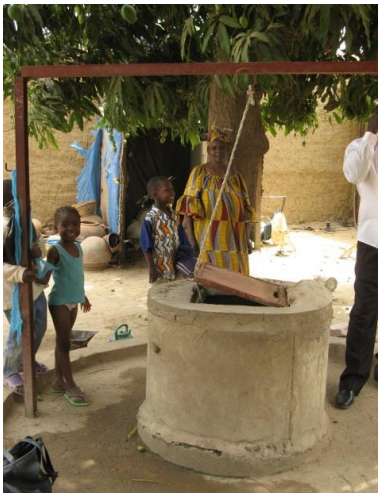
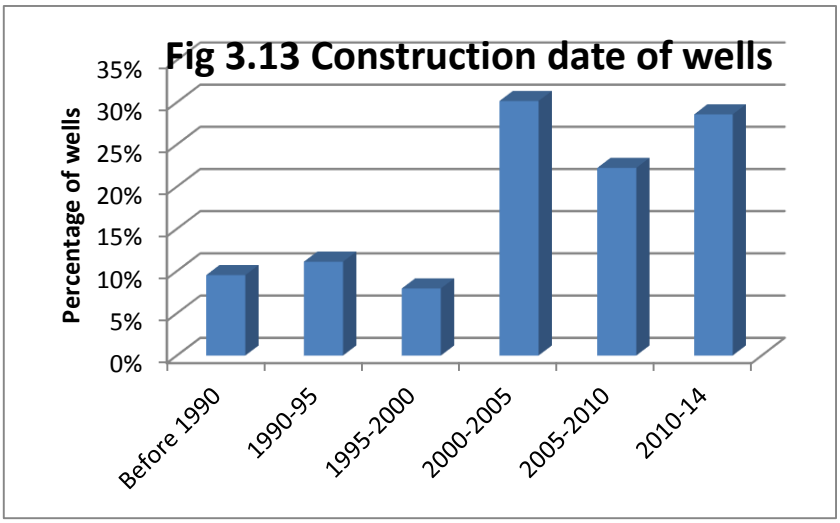


Fig 3.12 Rope and bucket stored on a post.

## 3.11 Age and trends in construction

Originally most water for domestic purposes was taken from surface water sources. However over the years it has become more recognised by rural people that there is also water under the ground nearer to their homes. At the same time, a lack of knowledge of how to line wells and stabilise the shaft walls meant that the depth of wells was often limited and indeed there were areas where wells could not be excavated safely. Slowly expertise is spreading and wells are being constructed more widely. Interestingly, although the coverage with conventional community wells and handpumps is the highest in East Africa and continues to grow, it appears that it in the area surveyed this is not leading to a reduction in the construction of traditional wells (see Fig 3.13). Since 2010 to 2014 only covers 4 years, it seems that from 2000 onwards the rate of construction seems to be rising. Rate of construction and levels of investment are closely related to how good harvests have been, and so may also be linked to rainfall.




If these wells are typical of the district as a whole it would suggest quite a major move towards construction of convenient but less well protected supplies. Over the past fifteen years the increase in the number of traditional wells has averaged about 7% a year which would imply that there are over 350 new wells being dug by traditional means every year. This is a large number and could contribute significantly to the economic life of the district but also, with a little further investment, to the health and well-being of many inhabitants who are investing because they feel that this is a development which can really improve their quality of life.

Overall it would seem that the use of traditional wells is not diminishing as new alternatives appear. It is therefore important to define what risks they bring and what improvements can be made. It is also necessary to understand the benefits they bring which drive people to continue to invest in them. These are explored further in Chapter 4.

## 3.12 Challenges

- Limited existing levels of technology and innovation. Extremely few pulleys or windlasses or aprons on wells.

- Too many wells close to latrines. Conflict between desire for convenient latrines and wells and the need for them not to be too close to each other.
- Njombwa wells with narrow diameter which makes them expensive to line, and difficult to deepen.
- Unreliability of wells in certain areas.

## 3.13 Opportunities

- Groundwater is widely accessible at shallow depth
- There are already many hundreds of traditional wells in the district
- Two-thirds of wells are unlined, but most are of adequate diameter.
- Over half of wells are cleaned out regularly showing a) an interest to care for them and b) potential savings in money and effort if they are lined
- A few wells have concrete rings as an impermeable top lining and rings and moulds are available in Kasungu
- Few wells are adequately covered. It is seen by users as a point of risk and can be a cheap and simple improvement.
- It is estimated that around 350 new traditional wells are likely to be being dug each year in the district. This offers additional potential for further investment in improvement.

## 3.14 Conclusions

The potential for self supply in well construction and up-grading appears to be large. The number of existing traditional wells and the rate at which they are increasing, cannot be ignored, but needs much effort and encouragement to get people to invest sufficient funds to reach a standard where risks are minimised and convenience, performance and easy access are optimised.

In CLTS projects as well in water supply construction there needs to be discussion with householders on what are their priorities in siting wells and latrines, before either is constructed.

# 4. Socio-economic aspects of well-ownership and water use.

## 4.1 Well ownership

### 4.1.1 Well owners.

Well ownership is not as simple as owning a bicycle or even a house. Water is regarded as a commodity which is not like any other, since there are usually social obligations as well as benefits from owning a supply. In some cases the motivation and the resources for constructing a well may come from an individual and in others it may be that a group of people get together to solve the problems of the community as a whole. However it is usually more difficult to get a group to make joint decisions, than for an individual to make one, so although a group may be able to access more funds, the management and control of the facility constructed can be much more problematic. There is generally a much stronger urge for individual investment than for group investment, but in Malawi there seems also to be a strong community spirit.

From the survey of sources it would seem that 61% of traditional wells are owned by a specific family or individual and 38% by the community. However in Kaomba TA it is the other way round, which may be due to the peri-urban nature of the area, or to cultural differences. Whatever the reason, it means that any promotion of up-grading and new excavation would need to be done differently depending on the type of ownership within a TA.

### 4.1.2 Characteristics of well owners

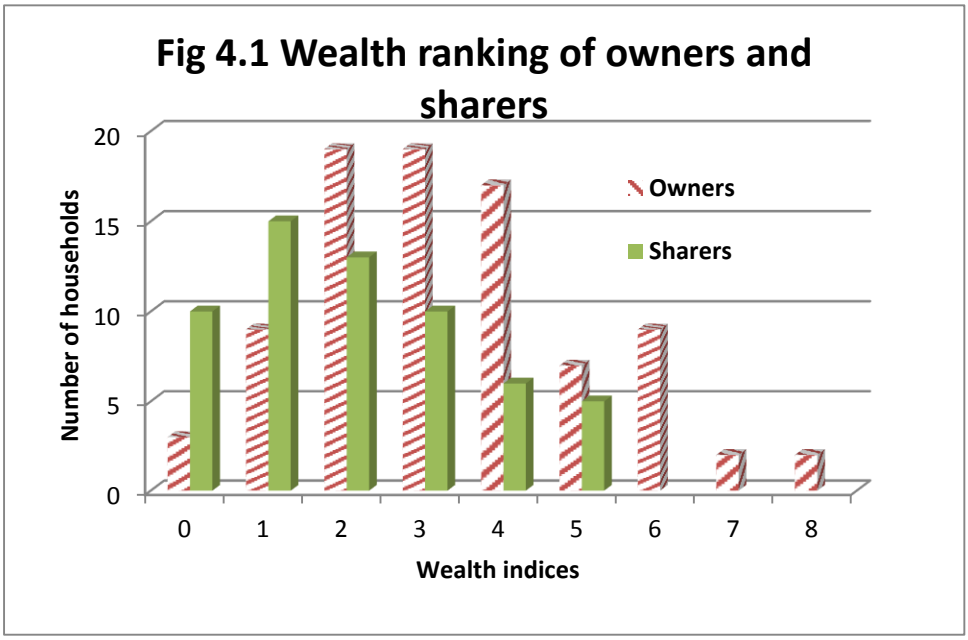
It might be thought that those who can afford to dig wells are only the richest, however using a simple wealth ranking it would seem that whilst they are people who have disposable income, they are not necessarily the wealthiest of those. The ranking took into account ownership of tin roof, ox cart, radio, tv, motor bike, goats a cement floor and also whether the family had members who could send remittances home. 35% of well owners had two or fewer of these elements of wealth. They are people who care about their home and their family, and so put priority on their homes. Relating to countrywide statistics, however, those who have invested in their own wells have above average provision of cement flooring (38% compared with 14.1% nationally)[14] and 84% ownership of radios (compared with 64% nationally in 2011)[15]. 57% of them have a tin roof. These are aspects which can be used in promoting up-grading and helping people to see how they can afford to make changes as they have already freed up capital to improve other aspects of their house. Well owners are not so much the very wealthy, but more those who have begun to move up from being the poorest.

However as Figure 4.1 shows those who share possess significantly fewer of the wealth indicators used, two-thirds falling in the lowest quartile (compared with one third of owners). This suggests that wealth plays a part, but also that the wide practice of sharing ensures that the benefits well owners find are also shared with the rest of the community. Thus such wells tend to act as mini-community water supplies, whether they are community owned or not.

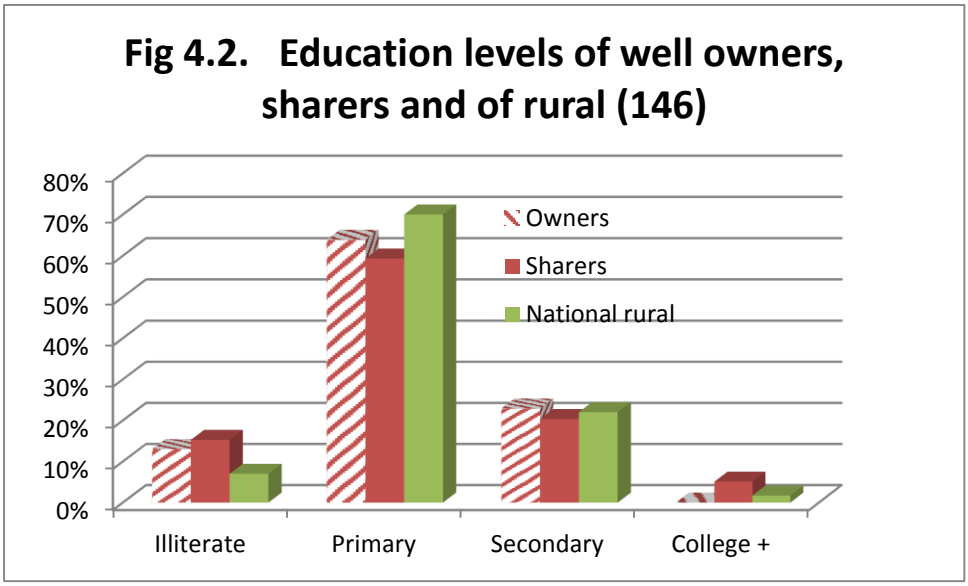
In terms of education, well ownership is not confined to the most educated households. The education levels of the well-owning household heads appear roughly to follow the national

[14] DHS Malawi Survey 2010.
[15] MEAS- extension.org/meas-offers/case-studies/radio-based Referred to Feb 16 2015

educational levels for rural people (see Fig 4.1). There are above average numbers of well owners who are illiterate (13%), about average of those with secondary education (22%) and slightly less




than the national average with primary education (63%). None had had further education. Those sharing wells were essentially similar in education levels to those owning them, (see Fig 4.2). It would appear that it is less level of education that influences people into solving their own water problems and more their initiative and wish to make changes to their lives. In this they are likely to be regarded by as early adopters who are admired by their neighbours. Indeed almost a third of well owners could identify people who had copied from their idea. This needs to be incorporated into marketing strategy.




79% of well owners count themselves as farmers, compared with farming being the national rural occupation of about 65% of the rural population (DHS 2010). 12% are traders which is lower than the national average of 19%. Yet it should be traders who could most easily invest and also act as an example to others. The high level of farmers taking up the idea of having one's own well seems to

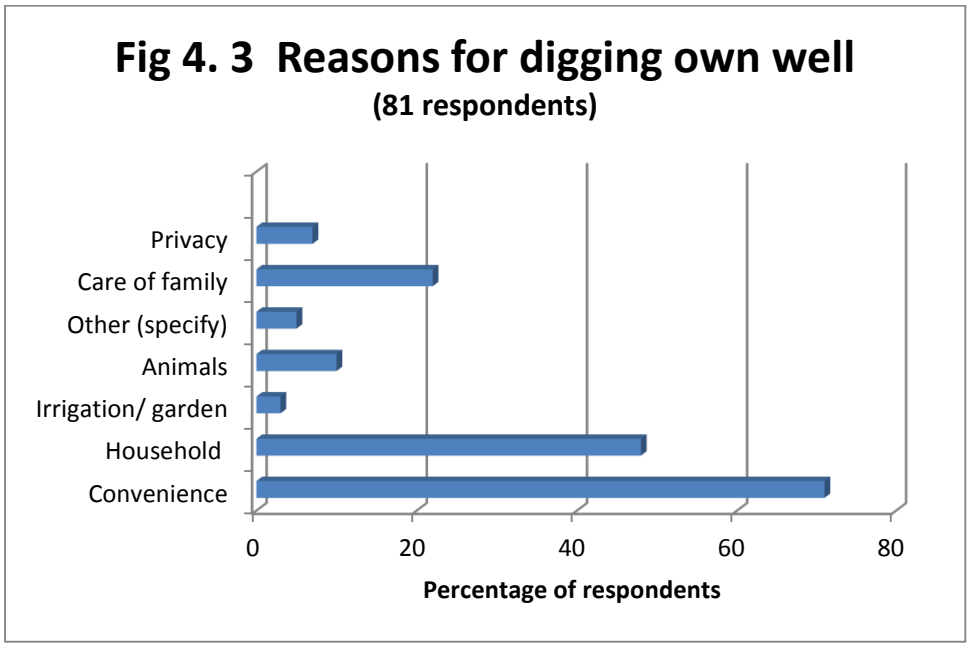
be mostly to do with the scattered nature of their housing rather than their productive use of water (see next Section)

### 4.1.3 Reasons for construction.

Section 3.10 showed that in spite of the increasing coverage with conventional community wells, there seems to be a continued sizeable demand to dig one's own well. To understand this we need to know the reasons why people are doing it.

The overwhelming reason is convenience. It matters greatly to families that they can access water when they want it and without having to go any distance for it. If a family of 6 want to have 27l/hd/day as per the national standard[16], this means 7 trips both ways for water collection (see Section 1.3). It is not just the time, but as several households mentioned, having a closer source means that water can be collected without having to take all the children with one. The time saving means more time and energy for household chores and childcare as well as for productive purposes. This especially true for larger families, where to provide enough water for everyone can take many hours for one or two people. The average size of well-owning family is 6.7/HH compared with national average of 4.4 and 5/HH for families sharing the supply owned by others).

Having more water for domestic purposes was the second reason, because whilst very few households (and then usually only the smallest) can collect 27 litres per head, with water several hundred metres away many do not collect a fraction of this. So it is not just having access to more water, but being able to bring more of it home for the same effort. Two thirds of traditional wells in Kaomba and 90% in Kawamba and Njomba were within 30 metres of the house, which dramatically reduces the time spent collecting water. This is allied to wanting to provide the best possible care to the family. Surprisingly few people are linking more water to income generation and having healthier animals.




[16] Sector Performance Report 2011: Malawi Irrigation, Water and Sanitation Delta Partnership for MoIWD

Yet this can offer a powerful incentive and help the repayment of any loan. Certainly farmers interviewed in Njombwa were excited when they started to think of vegetable growing as a way to help pay for a well. The other reasons given were its use for building and brick making, fear of crocodiles and the great distance to any other supply.

### 4.1.4 Relationship to sharers.

Interviews with people and communities who regard themselves as well owners shows that it is unusual for the well only to be for the use of direct family or investors, with 96% of owners not restricting who may use the well. Only where there is payment for water, or request for assistance in digging or maintaining the well and none is given, might people be unwelcome to use it. Whilst it is especially larger families who may be driven to dig their own well, most have a large extended family living around them. As a result 22% of wells are used only by family members but 78% are not. 'Water is special' as viewed by the owners and the community, and is an asset to be shared. Being able to share it brings some kudos to the owner but also a feeling of being able to serve the community.

When asked what was good about having your own well, much the commonest answers related to being able to share, with phrases like ' water is life, there is no need to deny others', and 'everyone has a right to water'. This applied equally to community owned wells and family owned ones.

The obligations of sharers are not onerous, with few paying regular contributions. Since the owner of a private supply often prefers to pay for repairs himself (thus keeping control over his asset), the main difference between community and family owned wells is that a smaller proportion of sharers in private supplies pay a contribution when repairs are needed (see table 4.1).

| **Table 4.1 Obligation of sharers** | | |
|---|---|---|
| **Contribution to supply** | **Private** | **Group** |
| They pay regular contribution | 16% | 14% |
| They pay contribution when needed | 22% | 36% |
| They help with maintenance | 59% | 50% |
| They work in owners fields | 3% | 0% |

In return in over half of cases, sharers help to keep the surroundings of the well clean and tidy, in a few cases making a rota of families responsible for a given period of time.

They also keep to any rules the owner or owning group institute, but neither type of ownership is more likely to institute rules than the other. Commonest rules (44%) relate to forbidding the washing of clothes or people close to the well, to avoid accumulation of mud and return of dirty water to the well. Approximately half of all wells have no rules at all. One communally -owned well limits the time when water can be drawn, but none of the others do. Other rules relate to keeping the area clean and shutting lids where they exist.

Not many owners (group and family) found problems in the sharing of a well. Most related to people not wanting to contribute their time to maintenance/cleaning. Ten were afraid that too much demand was leading to wells drying up, especially when the traditional well had to be used by those who normally used hand pumps or taps, which had broken down. The traditional wells not only serve as a permanent supply for those closest to them, but also as an insurance policy for those

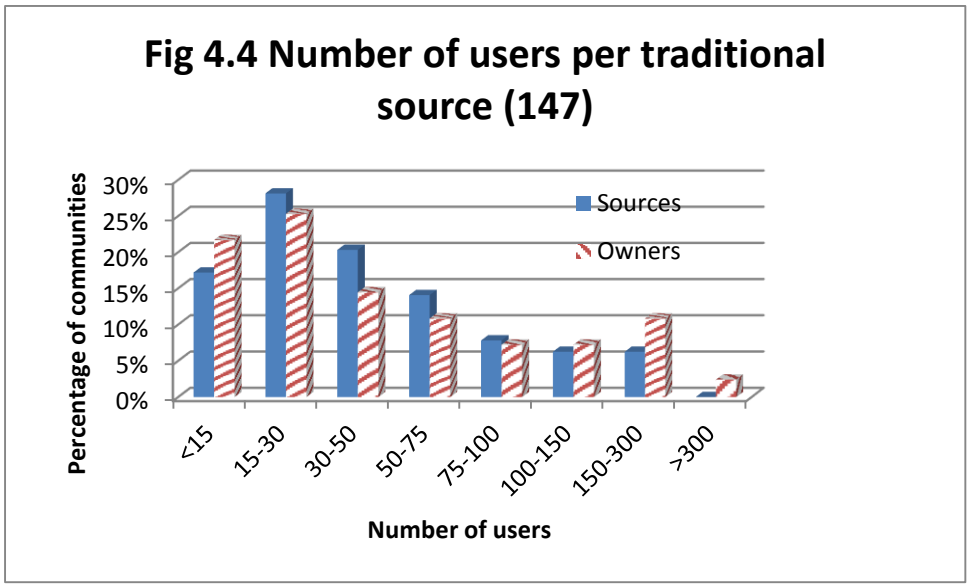
using conventional supplies if these break down, and as a reserve when those conventional supplies have too high pressure of demand, leading to time consuming queuing.

69% of well owners asked for no contribution to the cost of the well, with approximately equal numbers of the rest (14% and 16% respectively) asking for payment through labour (mostly cleaning in or around the well) or cash. Regular cash payment was rare except in areas where there was a piped supply which people were used to paying for and were looking for a cheaper alternative.

## 4.2 Traditional well water usage

### 4.2.1 User numbers

The chief advantage from the sector point of view, of traditional sources is that they can be a way of serving the smallest communities, and those where housing is very scattered. In these instances the cost of standard facilities in per capita terms may become uneconomically high, as do the repair and maintenance costs to the users. Fig 4.4 shows that 70-80% of traditional wells serve groups of 75 or less and 90% serve less than 150 people. The difference in the two sets of data is simply that one set reflects the information collected when surveying sources and the second when well-owners were interviewed, not necessarily at the same sources. The similarity of results from different sample populations confirms the reliability of the data.




Larger communities skew averages to some extent, but the mean number of users is around 70 in the wet season with a median of 41. In the dry season numbers fall marginally because about 10% of surveyed wells go dry or have less water, and some people then walk further to more reliable supplies. Dry season average numbers remain the same but the median drops (to 30) as users of the supplies with reduced inflow tend to re-distribute themselves to other traditional and conventional community supplies.

### 4.2.2 Drinking water sources.

There is sometimes an assumption that people will always use the same source for drinking water and that all the inhabitants of a community will choose the same source. Several factors often make these both false assumptions. Firstly women's lives are busy and on good days a woman may walk the extra distance to a protected source, whilst on days when she is in a hurry or queues are too

long, she may take it from a nearer or less busy source. Secondly sources dry up and pumps break down, leading to people shifting between sources. Thirdly some people may not wish to have to contribute in labour or cash to use a specific supply. Questions were therefore asked at both source level and household level as to whether a source was used for drinking water, and also at household level what sources people usually used for drinking water for their families. The latter question can also provoke a level of giving an answer which is the one the respondent feels is expected of them. There is therefore a range of 'the right' answer in relation to what people do to get drinking water.

At household level approximately a third (32%) said that their normal drinking water source was a protected source (tap, hand pump or rope pump). Results were very similar whether a well owner or a sharer (see Table 4.2)

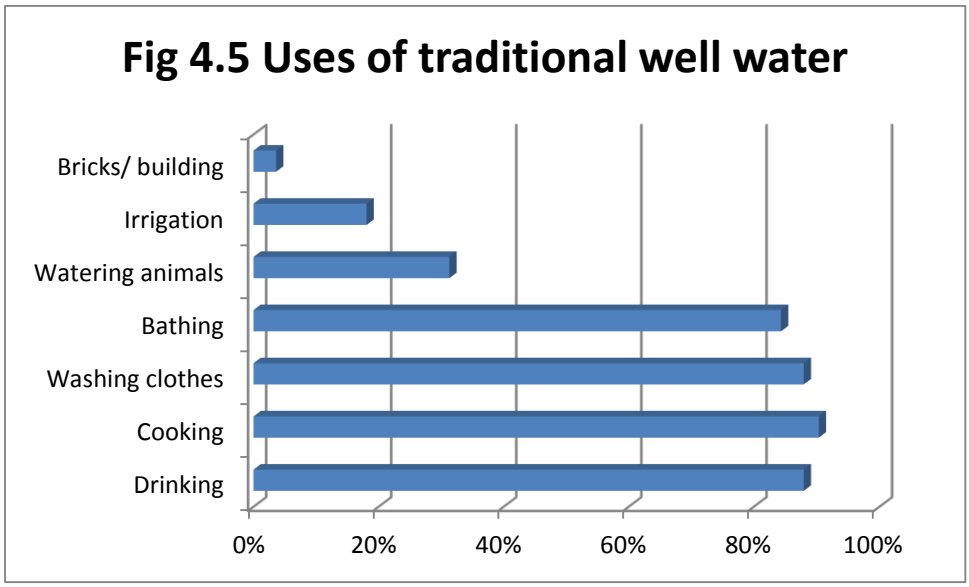
**Table 4.2 Drinking water source for households**

| | **Owners (83)** | **Sharers (57)** |
|---|---|---|
| 1. Tap | 4% | 4% |
| 2. Hand pump | 20% | 26% |
| 3. Rope pump | 8% | 7% |
| 4. Traditional well | 58% | 56% |
| 6. Roof water harvesting | 0% | 0% |
| 7. River/stream/lake | 6% | 7% |

At source level it seems that most sources were regarded as potable for some. 88% were said to be used for drinking water by at least some of those living nearby.

### 4.2.3 Other uses of traditional well water.

As Fig 4.3 shows, the main reasons for digging a well are for convenience and so also for greater availability of water in the home. Thus it is not surprising that this forms the bulk of water use (see Fig 4.5). Only 31% of sources are used for animal watering and even fewer (18%) for small scale irrigation, with a further 4% for other income generation through brick making, and building. Thus at present water is not regarded so much for its economic good, but more for its social value.



In marketing it needs to be remembered why people at present decide to dig a well, and to use messages related to that, as well as encouraging them to think more of the economic value of water which could help recoup the cost. Time saved can also be converted into several different benefits.

Instead of carrying water home for bathing and washing clothes, almost half of households go to surface water to do laundry and to wash themselves. The proportion in Kawamba is lower (one third) suggesting that surface water may not be so easily accessible there, as an alternative.

### 4.2.4 Water collection and storage.

The type of container used to collect water enables or limits the volumes of water collected. In surveyed households (96%) use a bucket or pail to collect water in. 11% use an open basin or pot, and 23% a closable plastic jerrycan. In many other parts of Sub-Saharan Africa there has been more of a move towards the use of jerrycans. This has several advantages-:

1. Greater volume can be carried in one journey, without spilling
2. The container can be sealed closed, reducing contamination
3. The container can be carried on a bicycle or cart, so making it possible for men to play a more major part in water collection (men generally will not carry a bucket , because it needs to be put on the head to minimise spillage).

Jerrycans are more difficult to clean out directly by scrubbing, but can be scoured by shaking gravel/sand and water in them. Initially they may have a taste of plastic or oil, but once cleaned provide do not affect taste. As such their promotion should be considered as an important element of Self-supply.

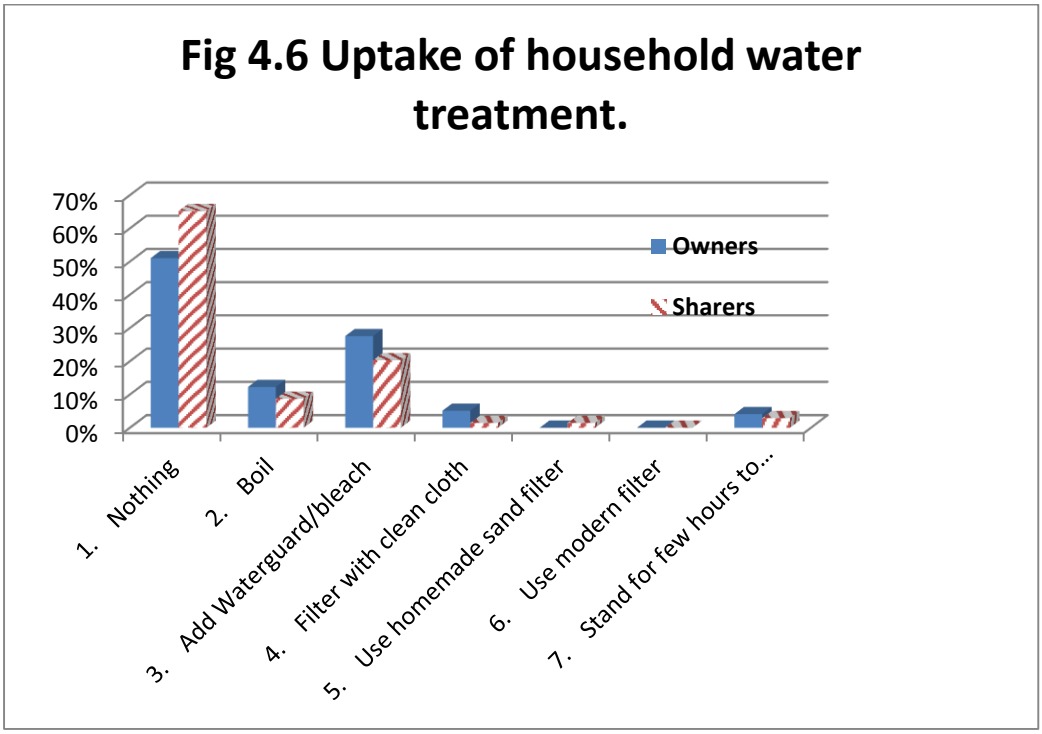
## 4.3 Household water treatment (HWTS) and drinking water.

Using unprotected sources implies an increased health risk over protected sources. However in Malawi even protected sources have been shown on occasion, not to provide safe water. Using the data from two separate surveys ( [17],[18] ) covering some 757 protected water points, only 16% had no faecal coliform, and 30% had less than the national standard of 50 FC/100ml. As a result there have been moves away from chlorination of wells to water treatment in the home[19]. At times Waterguard has been distributed for free, but generally there is a move to make chlorine and filters more available through commercial enterprises. This is something the Self-supply project plans also support and promote through the training of entrepreneurs and support to the Interaide WASH shop in Kasungu and associated traders.

51% of well-owning households do not carry out any form of water treatment, and a higher proportion (65%) of those who share the water point with them. This may partly reflect the difference in financial status but also perhaps the greater initiative of those who have dug their own well, in picking up new ideas. Of the rest, 20-28% use Waterguard/ bleach, but other methods are little used (see Fig 4.6). The merits of leaving water to stand and let particles and bacteria settle to the bottom (removing around 95%) is little followed, but may be happening without being planned where water stands overnight. (In some cultures the water is not acceptable the next morning and

[17] Taylor H, Ebdon J, Phillips R Chavula G and Kapudzama O. 2012 Assessment of drinking water quality for low-cost water options in rural Malawi. Final report Nov 2012.
[18] Pump Aid Water quality survey of 284 wells in 2013.
[19] Household water treatment and safe storage. National Action Plan from 2013-2018 Aug 2012.

gets thrown away). There appears to have been almost no promotion of modern filters such as the Tulip filter, or certainly no successful promotion, in the areas surveyed. This is an option which could be offered alongside Waterguard in WASH shops. Several households remarked on the problems of acquiring such products from local shops.




In both groups equal proportions (sharers and owners) sometimes treat their water, but far fewer always treat it (6% as opposed to 19%). No-one seems to be driven by outbreaks of dysentery or cholera to adopt HWTS even temporarily.

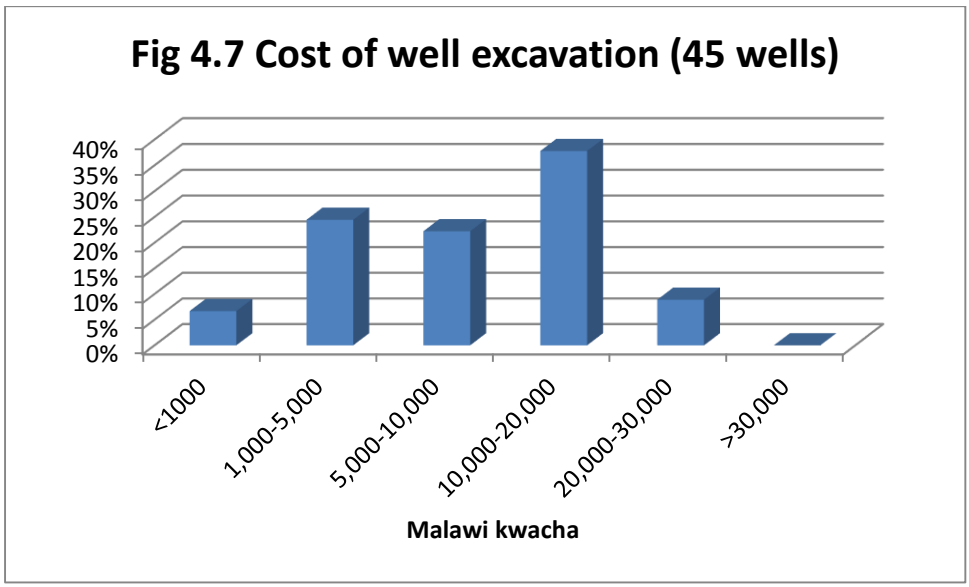
The decision to adopt treatment does not appear to be linked to the type of source from which drinking water is taken. Someone taking water from an unprotected source is no more likely to treat the water than someone who takes if from a handpump. In terms of wealth ranking those who are in the top quartile are significantly more likely to be in the group that always or sometimes treat their water. However where education is concerned those with higher education and those who are illiterate are more likely to treat their water on a regular basis than those who have primary or secondary education. Those with secondary and further education are more likely to treat water sometimes, suggesting that they may respond more to specific campaigns.

## 4.4 Costs

### 4.4.1 Costs of excavation.

People invest either time and/or cash in having a well. In most cases they employ a well-digger and/or unskilled labour, whether it is a group water scheme, or an individual family one. The cost varies with the expertise of the well-digger, the competition in the area, the depth to water and the hardness of the rock. For the 45 wells for which owners knew how much had been paid, the average cost was around 11,000 MK. Wells dug by traditional well-diggers more than ten years' ago were in

the range 1,000-5,000 MK, those in the last few years more likely to be in the range 10-20,000MK[20] (see Fig 4.7). Those for less than 1,000 MK reflected well owners paying unskilled labour to work with them.




27% of well owners had dug the well themselves, only on two occasions employing unskilled labour to help them. 11% of wells had been dug by a group/ community, generally without additional professional inputs.

Other costs (such as well rings, brick lining, and rope pumps) are discussed in the Section on the private sector.

The cost of water to those sharing is not high, among the minority that are required to pay at all, and they are mainly on communal supplies. The average payment pre family per year is some $950 or approximately US$ 2.

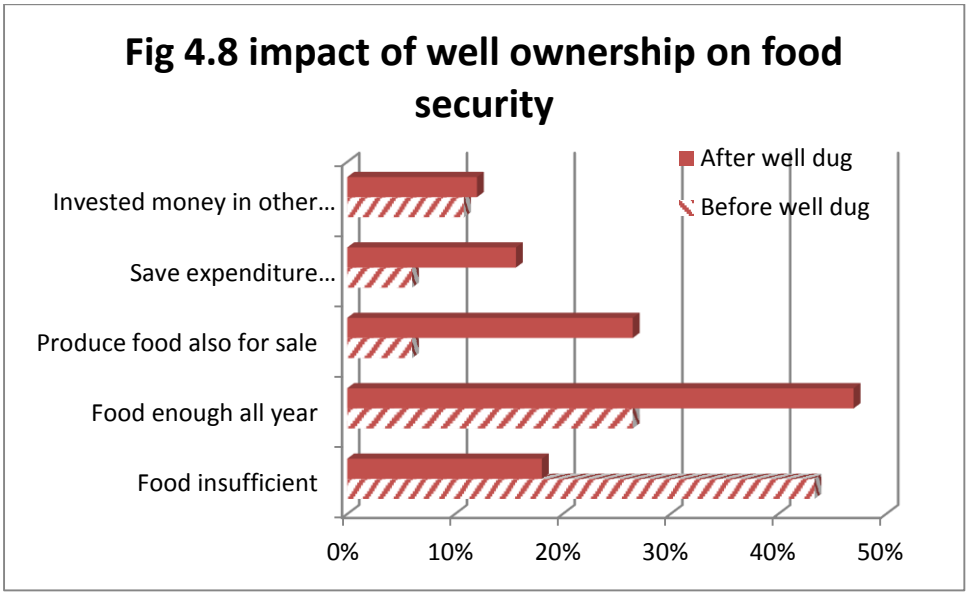
## 4.5 Benefits

### 4.5.1 Impact on food security

Although only 18% of owners use well water for irrigation and 35% for animal watering , this and the time saved by having water closer to the house mean that food production can increase. Thus well-owning families and those neighbours whose distance to water has been significantly reduced, can see a material improvement in their food security. Those families using wells dug in the past five years were asked to think back to their situation before the well and measure it in terms of food security and then to do the same again as a separate exercise relating to the situation after the digging of their (or their neighbour's) well. Only one out of 83 families noticed no difference. For the others there had been a significant shift towards greater food security and more opportunity to sell produce for cash. (see Fig 4.8). Many saw an increase in income from selling crops, and also a saving in expenditure from being able to eat their own produce. However despite the greater income and lesser outgoings, very few saw this in terms of the opportunity to invest back into their farm or well. This would need exploring during development of marketing messages, to see what use they found

[20] US dollar exchange rate at time of writing – 450 MK = 1$US.

for extra cash, and whether it could be more available for re-investment. One remarked in investing it in school fees and one in irrigation.




### 4.5.2 Change of source.

Owners whose well was constructed during their adult lifetime, were asked what source they used prior to constructing their own well (see Table 4.3)

| Table 4.3 Source used previous to digging their own well | | | |
|---|---|---|---|
| **What people moved from** | | **Reduction in distance** | |
| **Protected well** | 13 | **None** | 12 |
| **Unprotected well** | 33 | **100-500 to <100 m** | 18 |
| **Spring** | 1 | **500-2000 to <100m** | 26 |
| **River/stream** | 12 | **>2km to <100m** | 2 |
| | 59 | | 58 |

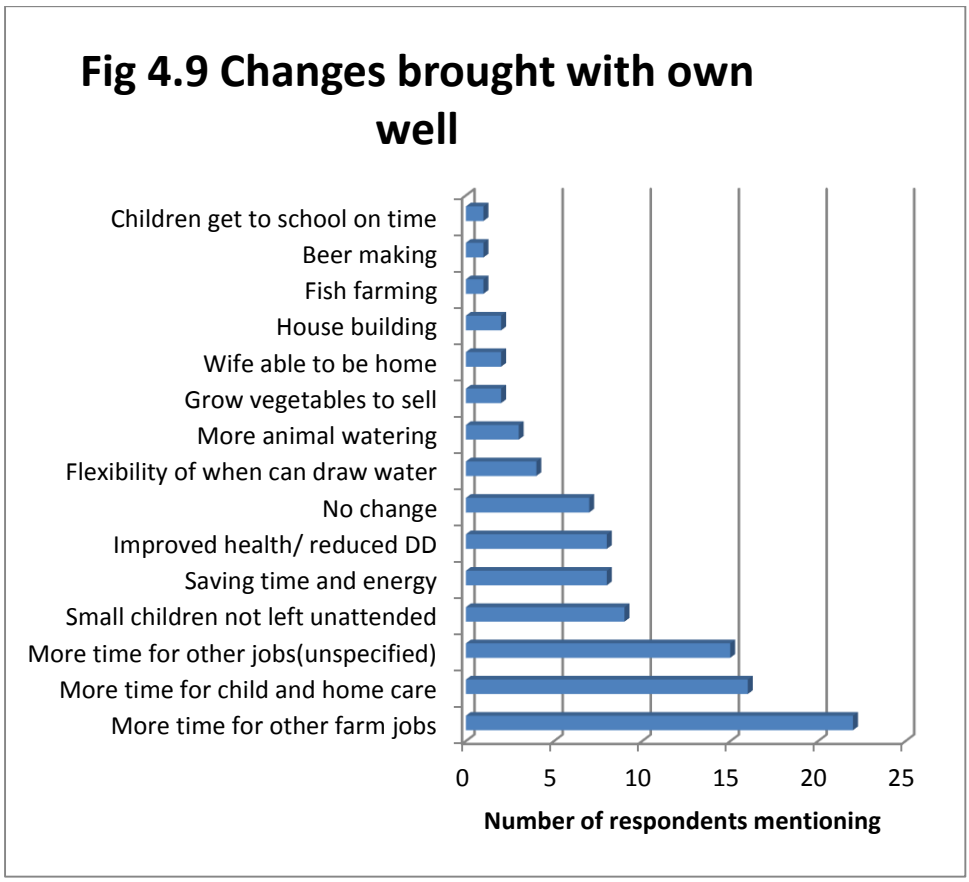
It is encouraging to see that 20% are people who previously collected surface water, from which there is higher risk. Indeed moving people from using surface water to ground water is the first step which can be taken in health risk reduction. Surface water users generally had also further to travel to the source. The same is true of those who moved from using a conventional community supply and for almost 80% of all those who answered, there was a noted reduction in the distance to travel. However most (more than 50%) moved from using another unprotected source, which reflects the tendency to want to copy what others have done, if it is an affordable option.

### 4.5.3 Benefits to owners of traditional wells.

These benefits relate particularly to the reduction in distance, but reflect a range of aspects of quality of life. They were elicited through open ended questions but a limited time for discussion, which did not allow much time or depth of thought. (Table 4.9) They need to be built into any marketing discussions which raise awareness of families to the ways in which investment in a well may benefit them.

On the other hand almost half of families interviewed had not noticed any change in agricultural production in terms of water use, which confirms that at least half of families do not use water for

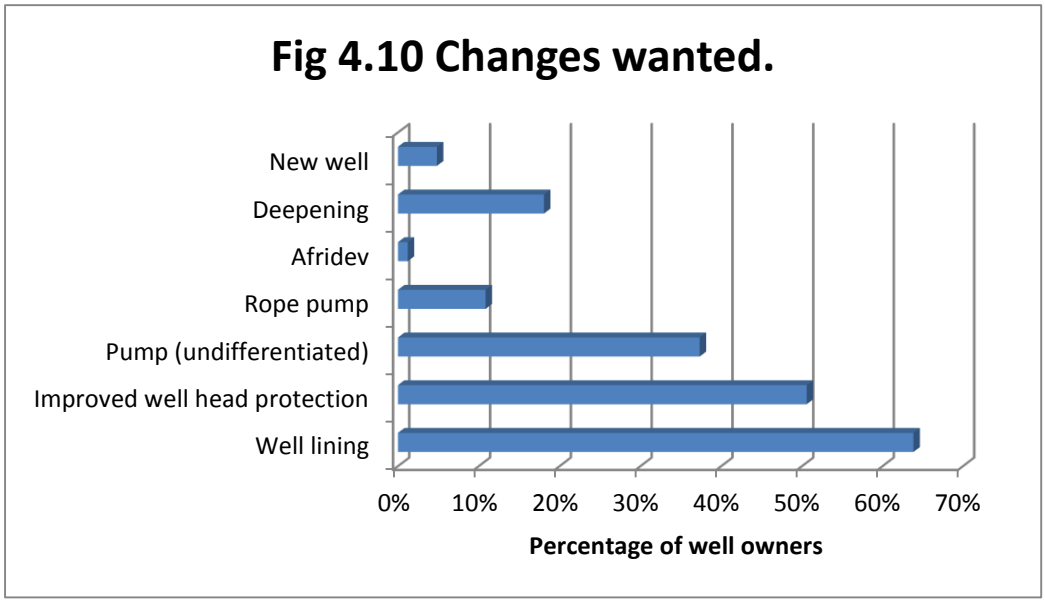
productive purposes. Of the remainder a third had expanded the area of crops and 16% had introduced different crops (especially vegetables), so both time-saving and water availability had had an effect. 8% had increased the number of animals in their herd/ flock.




## 4.6 Changes wanted

### 4.6.1 Well owner aspirations

In terms of building up better services for Self-supply, demand for specific aspects of improvement are as follows (Fig 4.10) from existing well owners/users. Lining and changes to the wellhead form



the main improvements wanted, including installation of a pump. The sizeable number of unlined wells (see 3.3) as two-thirds are unlined, skills in lining separate from well digging could also be valuable. In total equal numbers of well owners/ users also wanted to install a pump as part of better protection. The introduction of top lining, parapets and top slabs could form one step with a low cost cover, with installation of a pump done as a second step if resources are limited.

### 4.6.2 Affordability/willingness to pay

Well owners were told roughly the cost of a rope pump and of cement for top lining. Kasungu is a district with high coverage and a history of NGO activities bringing services for free, which has conditioned people to look to others to solve some of their problems. However those who have dug their own wells have already shown that they are people who have the initiative to act where they feel what is provided does not fulfil their needs. The principles of Self-supply were explained to them at the start of the survey, and once their 'wish-list' was established, they were asked what proportion of the solutions they thought they could pay for themselves. Over two-thirds (72%) feel that they could cover a half or more of the cost, and almost a third (31%) feel that they could cover all the cost. This is a hopeful sign for the up-take of Self-supply services.

Comparisons were made with the costs of roofing a house. Roofing sheets cost around 6,000 MK for a 3.5m length, and most houses need some 16 sheets or almost 100,000 MK. Home owners explained that they could not necessarily buy them all at once but would need more than one harvest to assemble enough sheets. However 100,000MK was an achievable sum over time.

Those who had paid for well-digging said that they had raised funds in a variety of ways (see Table 4.4). As mobile phone ownership has shown, most people can find a way to achieve something they really feel has a value to them. Constituency Development Funds (CDF) are available for those who wish to make improvements to their community, as a group.

**Table 4.4 How did you pay for well digging?**

| Source | Number | %age |
|---|---|---|
| Selling crops/livestock | 61 | 73% |
| Taking piecework | 10 | 12% |
| Funds from relatives/community | 11 | 13% |
| Taking a loan | 5 | 6% |
| CDF or other grant | 6 | 7% |
| | 83 | |

In focal group discussions it was apparent that groups are used to accessing loans, and that these average around 50,000 MK (just over 100 $US) ranging from 5,000-500,000. So group Self supply would fall in the range of costs that groups have previously sourced and paid back, and might also be available to individuals with support/guarantee from the community, who would also use the source.

However it is not just finance for which people feel a need for support, or planning. 71% of well owners recognise a need for technical advice, almost half want to be put in touch with the necessary craftsmen/ traders, and a quarter want to find how to access a loan. Advisory services are an essential part of support and need to be well trained and accessible.

### 4.6.3 Aspirations of well-sharers.

Those sharing wells were generally less satisfied with their supply, and almost three quarters of them (73%) were thinking about constructing their own supply. Of these 90% could correctly define the likely cost of digging, suggesting that they had actively explored the idea. Almost all gave 'lack of finance' as their reason for not proceeding, but lack of expertise, loan facilities and knowledge were also cited. It would appear that any marketing needs to look at ways to make people more aware of what resources they have, what loan facilities may be available, and what technical support can be provided.

Those sharing were asked what ownership and technology they would prefer if they have to pay for all maintenance. Communal systems were preferred as this spread the maintenance costs among more people, and conventional handpumps were the most popular for lifting water. The problems of management, and aspects raised as advantages owners expressed for their wells were not discussed. However when people were asked to say what they would like to construct for themselves 28% opted for a rope pump (possibly without any real experience of its use and performance), and 21% for a simple rope and bucket. 28% opted for an unspecified pump type, but within these 2 wanted a Malda, and one each an Afridev and an elephant pump. Three households perhaps rather unrealistically wanted a standpost (see Fig 4.14).

10% of respondents felt that they could dig the well themselves and a further 42% that they would have crops to sell. However the market in well-digging varies enormously depending on the quality and quantity of the harvest, and so ability to pay may not be very predictable. This is a risk in Self-supply marketing.

Sharers as a group seemed less motivated and inventive in terms of how to raise funds that the well-owning group, suggesting that it may be harder to get new groups/ families into well construction than in getting those already with wells to improve them. In both cases, well ownership and improvements could become highly visible signs of status which could encourage others to copy them. Once this situation is achieved, as the example of Zimbabwe has shown, Self-supply spreads rapidly and in a very sustainable fashion. This is not a state that can be instantly achieved but piloting should be able to indicate the potential and kindle the beginning of a fire that may become a blaze.

## 4.7 Challenges

- Self supply is relevant to community groups and individuals, and involve both the literate and illiterate. Marketing strategies need to be developed which include all these.
- Convenience of a waterpoint is very highly valued, but its economic benefit seems little recognised yet, so making an investment seems more of a burden when the return from it is not seen.
- Few sharers pay significant amounts to well owners, again reducing potential returns.
- Payment for water in rural areas is something of an anathema to families who regard water as a right so payment may not be easy for owners to institute where wells are owned by individuals.

- HWTS is not widely practiced on a regular basis. There is no linkage between treating household water and the source it is taken from.
- There is a less 'can-do' attitude among sharers of supplies, who are the potential new well owners, so they need to be targeted carefully and motivated.
- The rope pump is still a relatively new technology in the area and up-take may initially be slow.
- Income for investment varies widely with the quantity of rainfall and cannot be predicted. A poor harvest will slow down the rate at which Self supply expands.

## 4.8 Opportunities.

Those who invest in water supply share with their neighbours who may be less fortunate. This spreads the benefits of a convenient supply among whole communities, and is especially important in areas of scattered housing.

Copying your neighbour is a strong, no cost form of promotion

The potential for vegetable growing and other productive uses can encourage people to invest because they can see that they will get their money back.

HWTS is well known if not so much practiced on a regular basis. Low cost filters could offer a new cost effective option.

The significant benefits in food security and time saving can be made into powerful messages in marketing.

## 4.9 Conclusions

There appears to be a wide demand to improve access to water and its quality, but strong perceived barriers to private investment, which some are overcoming. Water needs to be viewed as an economic good as well as a social one of Self supply is to flourish.

# 5 The private and public sectors and their potential

The survey looked at the potential service providers who would provide the sustainable support to Self supply. Some of these are already providing services at a low level, others are yet to be convinced that Self supply has value to the sector and to rural economy. This section looks at the human resources available and the challenges and potential they offer.

## 5.1 Entrepreneurs

### 5.1.1 Well diggers

These exist at several levels but those which are affordable to the most rural families are those which operate locally and are based at village level. There seem to be quite a large number of them but with varying levels of experience. Some just dig one or two wells a year to supplement their income, or to help a family member, while others regard themselves as more professional and gain most of their income from this activity, returning to farming, being a mechanic or small trader only in bad years when harvests have been poor and so demand for wells dies off. No-one at present gets year-round income from well-digging because digging can only be done for about three months of the year. However if they became skilled in top lining and pump installation they could extend their activities throughout the year.

The growth in demand in the last ten years has led more people into this trade. Those who regard it as a profession undertake an apprenticeship with older more experienced diggers. A casual well-digger may earn 20-40,000 MK/ year, a 'professional' one 100-200,000 a year or more if he can also line the shaft.. Over the past two years number of wells completed has varied by a factor of four relating to harvest incomes. This may affect the trade trained well-diggers pick up in the year of the project.

Well-diggers only get trade by word of mouth. They do not publicise their work and may travel far for work as they are not available in great numbers. The baseline survey results show that there approximately 62 well diggers in target Traditional Areas. They have no professional organisation and no supply chain network as do traders, so they seldom know other well-diggers in their area or the prices they charge. One well-digger may charge just 7-8,000 for a well of 10 metres or more, another, in the same ground conditions may charge 25-30,000 or as high as 65,000. Lining costs a further 15-25,000 for labour but up to 50,000 including materials. Some people are employing local well-diggers, but for a better job, a few have looked further away, even as far as Lilongwe, for skilled diggers whose charges are at the upper end of the scale. Providing training may bring those of similar expertise to charge more similar rates, and show them how to price their work in ways which encourage custom but do not leave them vulnerable when things do not work out as planned. Such pricing methods could also make sure they can replace worn out tools. Most are frightened of pricing themselves out of a fairly variable and fragile market.

Some well-diggers are capable of lining wells with bricks, but most only undertake top lining and no well-head protection. Brick lining techniques are not widely known and concrete lining for soft ground is even rarer. Few are prepared to dig much beyond 15 metres but training in

concrete lining and better safety procedures might help them to reach deeper and so make wells more reliable where falling water levels are a problem.

Since most do not have experience of well-lining they would welcome training especially in this to expand the services they can offer and the income they can make. In general training would be brick lining but they should also learn how to make and install small diameter (0.8m diameter, 0.5m high) rings so that they can work in soft ground, and make impermeable top lining.

Hand pump installation was of interest to half of the six well diggers interviewed (4 formally 2 informally). It could perhaps partly be on-the-job training provided by the Pump Builder in Kasungu boma (Brighton) and the Area Mechanics if there is insufficient time during the courses offered in the latter part of the project.

Well diggers do not charge on a basis that really allows them to replace tools or introduce new ones. Most have a bicycle to get to sites, but otherwise there is almost no investment in items to make their work easier. The project should consider whether to provide an 'essential pack', and what that might include. A hammer, chisel and pick axe were most often mentioned in the 'shopping list' of interviewed well-diggers. A pulley, at present not used by most, might be used during training for them to see whether it would help their work be safer and increase the life of the rope. Although items such as a boiler suit are not essential, getting them printed with a slogan (or 'Fred, Your local well digger?)' is good for morale and provides easy advertising. (It might provide light relief during training to have a short break-out session on thinking what they would like put on a boiler suit or T-shirt.)

**Challenges.**

- The market for well-diggers is fragile and variable.
- Their skills are generally quite limited but a few have considerable experience and could be regarded as professionals
- Their expertise is generally not widely known and there needs to be a register of them for potential customers at both district and T/A levels
- There is no network to help them improve skills and learn of new developments.
- They do not like to operate below 15-20 metres maximum

**Opportunities**

- Well diggers skills can be expanded to provide them with a less seasonal income
- Their availability can be advertised more widely through social marketing channels
- They almost all own mobile phones and can be contacted/ informed of developments which might be useful to them.
- Their costs are low compared with any form of drilling and they can operate in most ground conditions and access almost any site.

### 5.1.2 Hand drillers.

There is one local contractor, who is a doctor based in Kasungu and trained by Mzuzu University, whose drilling team has made 6 boreholes mounted with rope pumps. These have mainly been for institutions. So far here the market is small partly because of the widely varying potential of local aquifers, and the high cost of initial investment. Up-take has been slow partly because of the lack of a communications and marketing strategy and it represents only a small part of the contractor's general business interests.
The cost of a borehole to 15m with a rope pump is 200,000 MK, and for a lined well with the same 250,000 MK.
So far success rates for hand-drilling have been low, needing several attempts to find sufficient water before boulders or rock are reached.
This contractor also manages well-diggers but this increases costs considerably.

**Challenges.**

- To provide a hardware service with an adequate level of quality control. The contractor is not known for his reliability.
- He takes responsibility also for rope pump installation, but the poor level of expertise is in danger of giving the rope pump a bad name.
- The market for hand-drilled boreholes is confined by the availability and lower cost of hand-dug wells on one side, and the speed, greater flexibility and depth achievable with mechanically drilled wells to cope with a wider range of ground conditions, on the other. Marketing of hand drilling is still very limited but could be better developed.

**Opportunity**. This skill is locally available, and could be developed further.

### 5.1.3 Pump manufacturers.

As with hand-drilling there is only one low cost pump manufacturer in Kasungu. He has a small workshop which limits the production of pumps, but can move if demand grows sufficiently. So far there has been no marketing of his products and he has only recently been able to set up a demonstration pump outside the workshop to advertise his wares, as the first stage of support from the project and of publicising his products.

At present he charges approximately 60,000 MK for a pump and a further 10-20,000 MK for installation. He can offer a windmill version (around 100,000 MK) and a low cost version (30-40,000). He has been well trained, is very motivated and keen to establish a market and good quality products. He has now been trained by Mzuzu University Centre of Excellence in pump installation as well as fabrication. His experience is so far quite limited (maximum 6 pumps) so the Self supply project offers a real opportunity to support an embryonic business which could not reach a level of sustainability without it.

It is not felt that in the initial stages of the project the market can bear more than one producer if he is to achieve a level of sustainability. low cost rope pump head, he has not yet

received training in marketing and small business development. He has successful experience of taking out a loan to grow his business and is looking to expand.

Panga Holdings is also a manufacturer of pumps for the area.

**Challenge.** This a fledgling small scale business, which requires considerable support and attention to overcome the teething troubles which face those trying to introduce a new technology and develop the market. The lack of expertise to date to produce the whole operating unit has severely constrained his ability to expand his market beyond the link to the hand-drilling contractor, and will be addressed in the coming month. Until this is done his access to the much larger potential market of traditional well-owners is non-existent.
**Opportunity** The expertise to produce rope pumps has already been developed to some extent and can form the basis for establishing the starting point of the supply chain which has a large potential market. This project offers the opportunity for medium term support for this small but essential business to achieve sustainability

### *1.1.1 Masons.*

Most communities have mason who carries out construction and repair of buildings, but these are generally not trained in construction of well head protection or lining. Those who have received training in Sanplat production would be suitable for further training since the technical skills required are similar. In some cases well-diggers also have masonry skills.
**Opportunity.** Masonry skills are widely available, but usually not to a high level. Those well-diggers who are masons should be given priority in training.
**Challenges.** Not many masons are skilled in concrete/ mortar work. It would be best to train well-diggers either to undertake the work themselves or to be able to supervise a local mason to provide a good job.

# 6. Stimulating demand

## 6.1 Aims and key elements

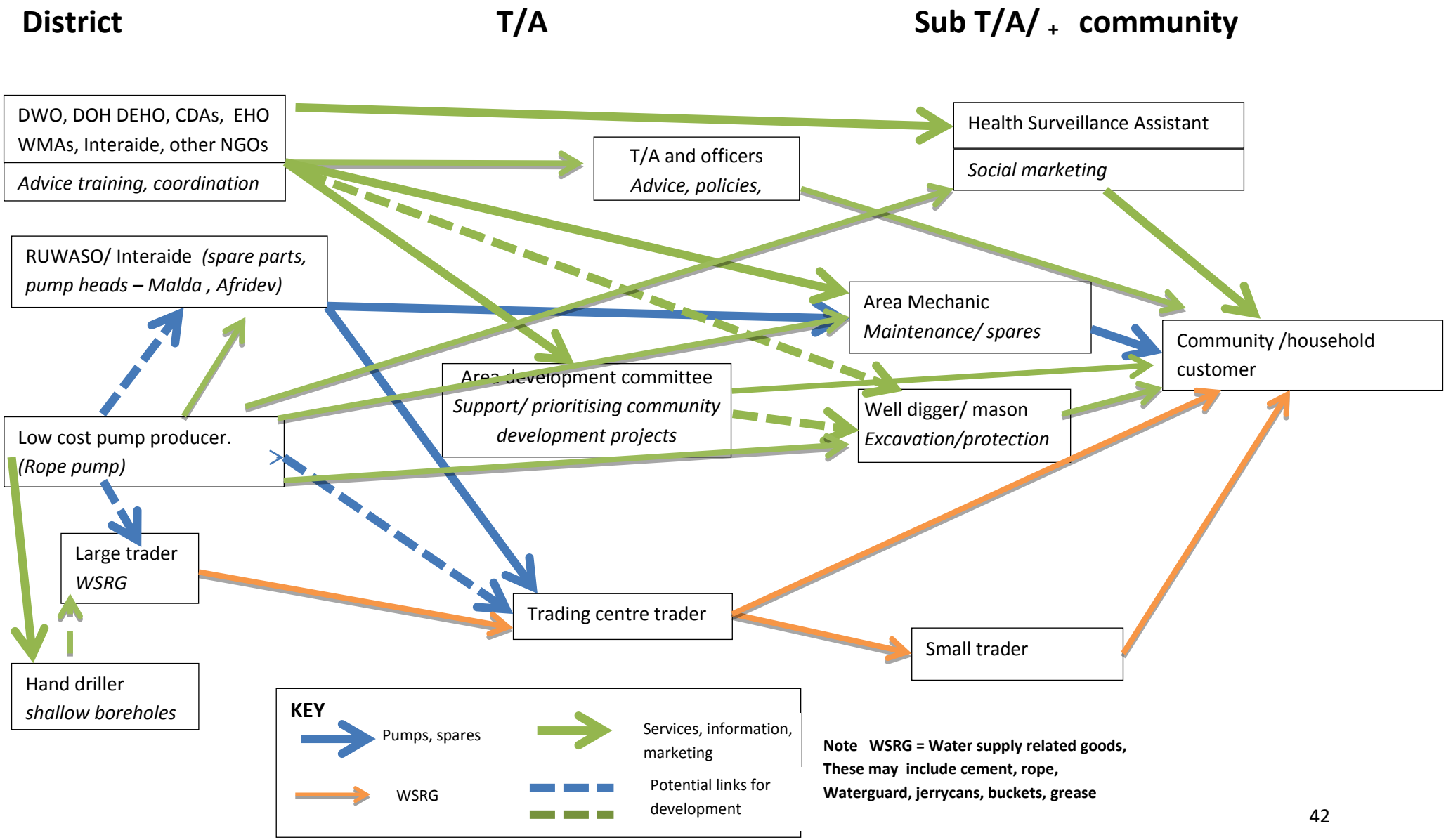
The main challenges in this project are in **stimulating the demand** for unsubsidised water systems through advertising that pumps and other technologies and services can be supplied locally and at prices which are affordable. Additionally there is the challenge of introducing an unsubsidised system into areas which are already very full of NGOs providing subsidised water supplies at high density throughout the district. It is also worsened by the fact that many of them choose to up-grade the best existing well to form a community supply, leaving the more difficult ones for people to up-grade themselves. The challenge is to get people thinking 'yes we can' not ' we are too poor' both through social and commercial marketing.

Figure 1 shows **the main stakeholders** who are involved in developing the market and their roles in relation to the customer. During the first year or so the project would also have a major role to play in publicising the options and opportunities for investment in water supply. Whilst social marketing would be the way for government extension workers to promote options, there is a need to help entrepreneurs get established and respected by customers, and they will not have the capital to advertise for themselves initially. For Pump Aid the most important activities in the coming months are training others to market themselves and supporting the advertising of the new services and new products on their behalf.

It is important to establish **the principles of Self supply** from the start. In particular to see that you can achieve things in small steps and don't need to think it is not possible because it cannot all be done at one time. Like building your own home, you don't necessarily have glass windows and a tin roof straight away, that may take years, but you get there little by little. The second is that having your own supply and caring for it shows that you are people with values and status, and a well is a highly visible sign of this. Treating water in your house needs to become a sign of sophistication and care for your family, not so much a health benefit, which is much less obvious.

Alongside marketing it is necessary to establish **focal advisory points** where advice can be sought. At local level this would be from Area Mechanics and well diggers, but at district level it should be the Interaide office and the DWO. Here there should be lists of well diggers and liners , especially those who are trained, with their contact details and names of some satisfied customers to consult.

**Fig 1. Summary of key stakeholders and demand creating linkages.** (modified from Supply Chains)




**Note WSRG = Water supply related goods, These may include cement, rope, Waterguard, jerrycans, buckets, grease**

## 6.2 Marketing channels

Some of the communications channels which could be employed for a strong campaign to trigger response include the following-:

**Networks including** -: Family, church, mosque, traditional leaders, school children, farming cooperatives, health and HSAs, agricultural extension workers. Use of WASH district inter-sectoral coordination committee, annual events such as agricultural shows and meetings of the T/A officers.

These should not be regarded as individual options but more as a pool of ideas from which several channels should be selected. A communications strategy will be developed which defines how different elements of the network could be involved and the materials they will need. Triangulation of messages so that people are informed through several different routes is most likely to strengthen response. The T/A network is a strong system to spread ideas, and the survey also shows high access to radio and the growth of radio stations which appeal to different age groups.

**Some small level of incentive** may help to encourage extension workers to promote the idea and also to record the changes that take place. Social marketing does not bring reward otherwise as commercial marketing will do. Initially in the first year any incentive would be through the project, but subsequently a small levy of service providers (masons, pump producers, well diggers, traders) payable to extension workers or other promoters might be considered in order to reach a critical mass. Extension workers would also be trained in methods to encourage communities or households to analyse what improvements they could make to their supply (see Encouraging Change), especially where there is concern over access to and reliability of supplies. Entrepreneur/ private sector/ media advertising/promotion would concentrate more on peri-urban/ small trading centre markets initially as many rural people regard them as more progressive and if the practice is established in these areas it will spread more easily to the others. These are also the best areas for early demonstrations, which can be identified during the market research phase. Campaigns in areas of scattered housing are expensive at household level and so gatherings, tobacco auctions and radio should be the first channels, alongside traditional routes and social marketing.

It is important to see how an improved water supply can be brought to people's attention and become something desired and shown off, like a good mobile phone. Copying others is probably the most powerful incentive for potential customers, and the environment in which this flourishes is a key area for promotion.

DAPP will have valuable lessons from which we can learn, but since they are giving pumps away the conditions are different.

## 6.3 Focal areas

It is suggested that promotion starts in well-defined areas which show the highest potential. However it would also be sensible to choose ones which have some of the following attributes:-

- Strong chief open to innovation
- Strong EHO and/or group of HSAs or very progressive ADC
- Village savings schemes and or farming cooperatives
- Successful sanitation marketing and entrepreneurs

- Wells which do not collapse too easily or ones which collapse and people feel strongly they would like to avoid the annual costs of cleaning out and re-deepening and the dangers associated with this.
- Some peri-urban /small town population which has already invested in high level house improvements and have cash
- Possibility for highly visible examples of well improvement for passers-by and also potential for road-side selling of vegetables
- Farmers wanting more security for their seedling nurseries early in, or before the start of the rainy season.

## 6.4 Exchange visits/ learning by example.

A low cost high impact option includes visits by extension workers/ facilitators to other areas with household level supplies, so that people can see the impact such a level of service has on households, but also possibly (positively or negatively) on community supplies. This could be within country to the DAPP projects in Ndowa or, for decision-makers in government perhaps to Zimbabwe. The demand needs not only to be from user level, but also to be acknowledged as an important factor in sector strategy by government, and as a niche with commercial potential by the private sector and by MFIs.

## 6.5 Subsidy to market development

UNICEF is clear that there should be no subsidy to customers, but there will need to be financial support to publicising services and for initial demonstrations of what Self supply technologies are available. It also requires building up DWO capacity to adopt an advisory, knowing those who can offer relevant services and the quality of their work. This information needs to be disseminated to all district coordination committee members and fed also to ADCs, as well as other service providers.

Different business models may develop for household water treatment (HWTS), for well digging or for pumps, or they may all come under one umbrella. Such models may include aspects such as lend-lease where well owners have benefit of the pump on their well for a fixed period (say six months) in easily visible sites, and then the option to buy the pump. The cost to them would be reduced by 10% for every pump they get others to buy (project covers difference during the introductory period).

Role of entrepreneurs needs to be discussed with all stakeholders before deciding to involve them at a management (rather than an implementing) level. It is an extra cost which is only justified if they are really keen to bring business in, and have the networks and influence to have big impact.

Initially the project would cover the cost of marketing to get the products and the concept established. However before the project is completed producers/ service providers would be expected to build some promotion costs into the cost of their service/ products.

Whilst there will be no subsidy, it is necessary to see how to finance demonstrations (but not use them as an excuse to, in effect, subsidise most early improvements).

Subsidy will effectively be through support to marketing, and possibly through temporary centralising of procurement of materials. Small scale well diggers and pump producers do not have the funds to buy materials in bulk and so initial price of products and services is high. PA should

consider buying in bulk and selling to producers at cost. This can be phased out if a good demand becomes established.

The other area of subsidy which may be considered is that of seed money for M/F loan systems, and the cost of setting up any revolving fund schemes as a way of making bigger investments more affordable. Such systems may link to existing village bank schemes or other agricultural systems. Traditional systems seem to be largely lacking.

## 6.6 Monitoring of results

Some baseline information has already been collected and more will be during the market survey stage. Self -supply involves only a negotiation between a householder and a service provider, it will be necessary to ensure that service providers are trained (and encouraged/ required)to keep records of the work they undertake where it relates to water supply provision or improvement. This information should also be available to district authorities.

Impact assessment would include economic, health, wellbeing, social, nutritional and other aspects of the household. It should also include something on any effects that the improved supplies are having on the usage and sustainability of other supplies to which the community has access, and also any impact on encouraging new families to dig wells, or adopt better practices.

One gap at present is in water quality prior to well improvement. A baseline of water quality in unimproved wells used for drinking is necessary if the advantages of well head protection and of low cost pumps are to be proven or dismissed. For ease of interpretation it is best to have 'before' and 'after' samples (preferably at least two and two), but where this is not possible, then a larger sample population is needed to detect significant change. Such data is most necessary to allow decision-makers at policy level to assess the value of Self supply and advocate for its recognition in rural water strategy. Demand needs to be created at all levels, not just among customers, if this approach is to become sustainable.

# 7. Summary of conclusions on Self -supply Potential

Before beginning selection and training of entrepreneurs the project wanted to ensure it had a strong understanding of the working context. Specifically we needed to know if there was a potential for self supply in the region, identify key issues for accelerating effective household investment and to define the main barriers to adoption and whether /how these can be overcome.

This report shows that self supply has been active and successful in Kasungu for a number of years. There is great potential to improve the technical and business skills of entrepreneurs in the area. Clearly convenience is a key driver for people to investing their own supplies. Communal, subsidised supplies do not offer convenience to the majority of users as they still have to travel a certain distance a number of times a day; an onerous task that can be dramatically reduced by a household supply. Already a number of potential customers cite convenience as their key driver to invest. It is now up to Pump Aid and our district partners to take these messages and develop relevant, informative and persuasive marketing tools so that the entrepreneurs we train have access to a much larger market.

Business training will be key particularly pricing, book keeping, developing a business plan and identifying and reaching customers. Entrepreneurs will have to be mentored through the lifespan of the project to ensure they have the skills needed to reach the market. By investing in monitoring and collected data on users we will be able to identify how and where they have access information and funds. This will give us the key data to develop lessons to support progress in the 3 TAs and develop a plan for scale up.

***Annexes***

1. Summary of local business perceptions.
2. An overview of self supply: background and case studies.

## Annex 1:

## Comments from local businesses in Kasungu.

*"I am more than willing to stock the new spare parts for rope and washer pump. However, I am not sure of the demand...the programme is very important as it will empower the community social-economically"*

Maxwell Nkhata, VG: Kamboni, TA: Kawamba

*"This project is welcome. I will be happy to be associated with it because my business will grow."*

LIVINESS NKHOMA, CHIYAMBI CHA ZERU SHOP, VG: BUA TRADING CENTRE, TA: NJOMBWA.

*"Ropes will be stocked when the demand is there"*

THOMSON PHIRI, VG: CHILOWA, TA: KAOMBA.

*"We will need more capital to enable us order rope and washer spare parts. Pump AID should help us on this"*

LEONARD FAISON, SUZA TRADING CENTER, TA: KAOMBA

## Annex 2:

## Self Supply Background: Self-Supply Case Studies in Africa and South America.

# I. Introduction

### I.i What is Self-Supply?

Self supply is the improvement of household and small community water facilities through investment by the user. This entails the modification and upgrading of basic water storage, transport and treatment services. In developing countries, due to the low purchasing power of users, improvements are usually made incrementally. This system complements and extends water supply provisions in areas (predominantly rural) where communal services funded by the government have not reached or are inadequate (Sutton, 2009).

Self supply has a number of characteristics that explain its widespread use in water and sanitation access in the absence of government and NGO operated facilities. The individual infrastructure, which includes wells, latrines and water treatment, is usually operated at the household level. A number of case studies exploring self-supply in Sub-Saharan Africa suggest that the sense of ownership of water provision helps incentivise people to incrementally improve their facilities. This is in contrast to communal infrastructure, where the problems of a common access resource are often found, hindering improvements and maintenance. Moreover, in certain examples, owners of wells tend to share with their community at low or no cost thereby negating the issue of unequal access that private ownership can bring. Finally, successful investments by owners are often copied by other community households, thereby spreading the benefits of learned experience.

The experiences of self-supply projects around the world have been, based on the criteria of sanitation, water cleanliness and ease of access, largely positive. A chief aim, to provide water facilities to neglected rural areas, has been achieved across broad swathes of South America (e.g. Honduras, Bolivia, Nicaragua, and El Salvador). Moreover, in Africa, performance is also encouraging. Zimbabwe, Ghana and Ethiopia among others have all experienced widespread adoption of private wells and other infrastructure with only limited government or donor support. A primary strength of the African initiatives has been the transition from surface to (at least) partially protected sources. Evidence from Cairncross *et al.* (2010) suggests that water-borne health conditions are reduced when such changes have been made. In South America, remote regions have access to household water via the widespread EMAS pump. By contrast, a limitation of self-supply has been the inadequate financial capacity of communities. The effect is often that once initial improvements are

made, both the embryonic private markets and inability to invest more capital halt the advance of such infrastructure, thereby limiting the poverty reducing potential. As such, self-supply often requires a strong enabling environment, supported by government or donors, to develop from its most basic form.

### I.ii Why is Self Supply important?

In many countries communal public water services are particularly inadequate or absent in remote rural communities. Sub-Saharan countries typically lack the economic resources to develop large-scale rural water infrastructure. Communal water points are limited by factors such as insufficient funding and high population densities. Additionally, such facilities are hampered by high non-functionality rates – in Malawi, as many as 30% do not operate (DFID 2012). A combination of inadequate spare parts network and insufficient motivation to fix a communal source are responsible. Evidence from Malawi suggests that communal facilities do not serve the small (less than 200 residents) and remote communities that comprise the 18% of people without access to safe water (Kayser *et al.* 2015). Therefore, self-supply initiatives can fill this gap in water provision in developing countries.

Achieving the Millennium Development Goals (MDG), in Sub-Saharan Africa in particular, is strongly dependent on the distribution and accessibility of clean water. Research conducted on water provision strategies (public and private) suggests that water supply is a key contributor to efforts to reach the eight MDGs (Sutton, 2009). Water quality and access are largely dependent upon government investment. The (predominantly rural) areas where investments of this kind do not reach are also those at the greatest risk of supply and sanitation problems. Overlapping the World Bank's governance quality indices and data from the Joint Monitoring Programme (JMP) on the extent and quality of water infrastructure reveals the strong relationship between governance and water supply in Africa (and elsewhere). For example, the link between spending on public services and revenue transparency, particularly in smaller countries, and water coverage, is a strong one. This is indicative of the important role that governments play in water provision. However, since a number of African governments are unable to meet the water needs of their people, private and externally supported initiatives have been required. Self supply therefore contributes to the MDGs by responding to the limits of state-led provision.

A report by the Ugandan Ministry of Water and the Environment (MWE), supported by UNICEF Uganda, corroborates these ideas. It highlights the greater productivity of self-supply, particularly in the context of agriculture, where centralised, communal facilities are not conducive to efficient farming (communal water supplies are often used less sustainably (Ostrom, 1990). Additionally, decentralised private wells, as opposed to, for example, communal kiosks, facilitate greater community productivity. Shorter queues and more accessible supplies contribute to lifestyle changes that, for example, increase time for entrepreneurial ventures and education (Mangisoni *et al.* 2008).

Below are a range of case studies that build our understanding of the beneficial attributes of self-supply projects around the world.

## II. Self Supply Case Studies

The case studies depicted here were chosen to show a range of experiences in self-supply projects. The key lessons and recommendations, alongside the overall approach section, formed the basis for an informative piece that could assist in the development of future self-supply projects.

The principle conclusion that each study makes is that self-supply is, or has the potential to be, an effective means of delivering water to remote locations in developing countries. In all the African countries discussed, the evidence suggests that the governments lack the capacity to extend communal coverage to everyone, despite major plans to do so in some cases. Moreover, partnerships with NGOs on self-supply seem to be emerging as a concomitant recognition of the limited economic resources develops.

Another area of concern and reiteration is WASH practices. The self-supply projects are generally viewed as successful in their provision of water to otherwise remote communities. However, while installing pumps and wells has proven effective, there remains in many cases inadequate uptake of healthy practices that would reduce the risk of contamination. Indeed, in South America, the prevalence of the EMAS pump design, which is often attached to a pipe that transfers water to the household, is partly a result of NGOs aiming to incentivise sanitary practices. Good sanitation depends on the whole chain of water provision being protected from contamination; the benefits of a high quality well are negated if water is collected in dirty buckets; a latrine may fail to prevent water-borne diseases if a select few people do not adhere to best practice. NGOs in South America have found that the lifestyle effects of piped water in the house motivate people to maintain good sanitation practices when they are associated with such a facility. Behavioural change, especially in Africa and deriving from education, is less developed than infrastructure in self-supply programs. Incentives have a role to play here.

On the limitations of self-supply, the studies reference a range of problems that are both ubiquitous and specific to particular circumstances. In Uganda, gender inequality continues to threaten the widespread success of a women-led operation in self-supply. In Sierra Leone and elsewhere the government's prevailing view about the value of self-supply and misconceptions and water quality hinder the progress of NGO assisted projects. There is an implicit limitation in the Honduran case. The authors cite the monopoly that one company has over the production and maintenance of self-supply facilities, which could potentially affect affordability, quality control and access.

**UGANDA**

**Case Study 1**: East & Central Uganda

**Organisation:** RWSN

**Author:** Carter *et al.* (2005)

*Approach*

The self-supply initiatives that have developed in Uganda are largely a result of incomplete public supply networks. While each privately owned supply demands a substantial cash and labour investment, they are rarely used exclusively by the owner's household. The propensity for private supplies to cater for a wider community is indicative of the culture of resource sharing in Uganda as well as the challenges faced in building a reliable supply – sharing a facility is easier than building your own.

In describing the approach taken by the RWSN in Uganda, the report by Carter *et al.* (2005) is referenced. Despite this work being dated by 10 years, it still provides a relevant summary of the strategy in Uganda, as highlighted by the MWE's 2011 report on the subject.

There is a strong emphasis on water decentralisation and private autonomy over provision in Uganda. Self-supply in Uganda has demonstrated a clear preference for demand-led projects whereby facilities are invested in on the basis of need. Moreover, water quality is prioritised over accessibility thereby justifying compromises in proximity to water facilities. The overarching approach reflected on by Carter is guided by a perception that communities are more efficient than households in managing private water markets; the formation of financial resource pools, for example, makes communities more able to maintain high quality facilities like fully protected wells than individual households.

The Ugandan government has tended to promote external funding (from the state and NGOs) for community water supply projects. The concept of self-supply has gained limited traction in official discourse, largely due to a focus on government-led, donor supported community projects as the mechanism of water supply. The government's overall approach is conventional in that modern, protected and piped water is considered the ideal situation. It frames water supply as one of two choices. Supply is either traditional and unsafe or modern and protected. Generally this dichotomy is exemplified by a contrast between individual self-supply ('traditional') and community-level supply ('modern').

*Lessons Learned and Recommendations*

Carter evaluates the approach in Uganda and concludes that a more pluralistic approach would be more effective and likely to achieve the goal of universal potable water. This would entail a case-by-case analysis to identify situations where self-supply has advantages over ostensibly modern community supply. The Ugandan approach should be assessed on the basis of five key values – ***access, quality, cost, reliability and management***. Carter suggests that the Ugandan dualism that favours community management is imprudent. Systematic cost-benefit analyses should be conducted to understand the case specificity so that strategies of supply can be tailored according to circumstances.

Another lesson to be drawn from the Ugandan situation is that external agencies, whether government or NGO, must not assume command of self-supply projects. A key component of efficacy of the projects in Uganda is the perceived autonomy over supply and management. The longevity and equality of supply is strongly influenced by this.

On the basis of experiences in Uganda, Carter recommends a set of principles for self-supply projects elsewhere.

1. Avoid thinking of water supply choices as a dichotomy between communal and self-supply. A range of context-specific supply methods is likely the best way to tackle water and sanitation problems.
2. Identify suitable ways of subsidising owners to expedite the improvement and expansion of supplies. E.g. Results-based monetary incentives.
3. Understand how to encourage effective management (e.g. by a community women committee) via technical assistance, information, or community organisation ideas.
4. Recognise the cultural specificity of target communities to find the best means of encouraging artisan training in water supply maintenance, by credit provision, apprenticeships or other means.
5. Self-supply must be incremental as necessitated by the limited financial resources of the owners.

**Case Study 2**: Women-led Project, Katosi, Uganda

**Organisation:** Katosi Women's Development Trust (KWDT)

**Author:** MWE (2012)

*Approach*

The KWDT initiated the project in an effort to mitigate the demographic and developmental forces that have disadvantaged women in Ugandan communities. The burden of water collection and other associated activities detracts from economic productivity. This has stifled the potential for women in Uganda to gain education and employment. The KWDT aimed to provide water sustainably at a household level to counteract the prevailing gender biased phenomena. The 230mm average rainfall in the area enabled the water harvesting approach.

The KWDT project aimed to build a network of water harvesting and storage tanks to mitigate the effects of rainfall variability. The approach was wholly organised and managed by female community members. The construction of tanks was undertaken entirely by women masons, with a select few being initially trained by external experts. The knowledge was then passed on by the KWDT members. The repayment, by beneficiaries, of the costs of installing a water tank in their household would be made in affordable instalments to a central fund. This would be used to ensure funding for the maintenance of facilities as well as permitting loans to subsequent beneficiaries. The scheme was initiated by the acceptance of donor funds from invested organisations (primarily – **Royal Danish Embassy**, **France Libertes** and **Waterloo Foundation**). However, after the installation of 181 storage facilities, the KWDT has managed to become largely financially self-sufficient, with the pool of money circulating amongst its users.

*Lessons Learned and Recommendations*

A significant outcome of the KWDT project is that the women have emerged as community leaders. As financiers and community organisers, the scheme empowered women to engage in managerial tasks and network with Uganda's urban-based businesses.

An obstacle to the proliferation of similar schemes across Uganda (and beyond) is the low literacy levels amongst women. The success of the project (181 tanks being constructed to a high standard) was partly based on the above average literacy and education levels among women in the targeted community. Therefore, part of any self supply scheme centred on women's involvement must entail a strategy to overcome or manage the discriminatory cultural norms that preclude female leadership roles.

The challenges experienced in this project have led to the following recommendations:

1. Transparency in any community organisation strategy is paramount, both within the leadership group (in this case, the KWDT) and between this group and the other members of the community. Inadequate communication across the community led to misunderstandings that could have been avoided with transparency.
2. A project oversight committee would be a useful body that could deal with disputes, organise long-term strategies and provide a venue for community discussion.

**Case Study 3**: Challenges of Self-Supply, Kitezi region, Uganda

**Organisation:** Individual Household

**Author:** MWE (2012)

*Approach*

The primary approach assessed in this case study is self-supply at the individual level. The trend for community supply infrastructure produces its own set of methods to organise and maintain the water storage and supply facilities. In this case, the need to overcome the problem of remoteness from piped water supplies was matched by a comparatively high income. Consequently, the technologies employed were used to provide a greater level of integration between the well, the rainwater harvester, and the house. An electric pump differentiates this approach from most – the access to electricity permitted this option. It was installed to enable the transfer of water from the well to taps within the house. The approach is indicative of an economic rationale to water supply. The transition from water collection from a nearby privately managed spring (which became costly) to the installation of a water tank, and finally to the electric pump well, was made because the long-term costs of supply were predicted to fall with these improvements. Moreover, the supply self-sufficiency ensured that the householders were not dependent on an insecure water source.

*Lessons Learned and Recommendations*

The subject family highlighted some fundamental lessons in self-supply. Foremost, they made incremental improvements to their supply as an immediate shift to fully-autonomous electrical facilities would have been prohibitively expensive. Additionally, the combined usage of well and water tank means that they are more resilient to seasonal variations in precipitation. The effects of an intermittent electricity supply are counteracted by a manual pump mechanism that allows the storage tank to be filled with water from the well in the event of an outage. The cost of water per unit is also considerably lower than collection from a third-party source – 1,500 shillings compared to 20,000. The initial investment is being rapidly repaid by the lower running costs.

This case is an example of success in a strategy – self supply in isolation – that is exposed to a greater risk of failure as well as initial cost than a community-based approach. Therefore, to advance this as a solution in other areas, a high degree of case specificity is required in the planning phase. A full understanding of the capital costs, the technologies that are appropriate and the risks of a collapse in welfare should the infrastructure fail, is essential. As well as this, the implications for social relations must be considered. The perceptions of an autonomous household, as in this case, can lead to demand for water from neighbours etc. Though they were willing to pay in this situation and ultimately proceeded to installing their own storage facilities, there are risks of conflict or exclusion associated with isolationist approaches.

Though the household has been successful thus far, the concept of isolated self-supply is not necessarily applicable to other regions. The comparatively high initial costs as well as the greater individual risks tied to failure mean that poorer households in regions of greater water scarcity and remoteness from appropriate technologies (e.g. rural Mali) are probably unable to follow such an approach.

The recommended approach is collective action that learns from the successes of such cases. This would however, demand a higher level of policy design so that the communities involved would be organised and aware of responsibilities in the construction, maintenance and dissemination of water infrastructure. Finally, a key attribute of a successful self supply project is whether clean water emerges from the well. The cost of water testing would be prohibitive on an individual level, but bulk testing of community wells is notably cheaper as well as more representative of the wider environmental hazards and vulnerabilities of the community to contamination. Hence this is another pertinent reason to promote joint supply efforts wherever possible.

**Case Study 4**: Jinja District, East Uganda

**Organisation:** Local Government

**Author:** MWE (2012)

*Approach*

The strategy employed by the MWE was based on findings from a workshop on self-supply held in Mbale District, East Uganda. The recognition of the importance of collaborating with local government led to an advocacy and technology sensitisation approach. This sought to improve the technical understanding of communities about the requirements of self-supply. Moreover, it aimed to forge connections between communities and local government agents to promote the development of private markets in tradesmen, spare parts and financial support.

The initiative was implemented with a three-stage approach:

1. **Sensitisation and advocacy**. A primary hurdle to government-run programmes is reluctance and suspicion on the part of local communities. Therefore, workshops were organised to provide an opportunity for officials and partner NGOs to promote the benefits of the project as well as answer questions from community leaders. These proved effective at reinforcing a perception of transparency and so mutual trust. Additionally, meetings of the District Water and Sanitation Co-ordination Committee (DWSCC) were held to promote consensus among the various stakeholders involved in self-supply in the region, from private to public entities. Agreement was reached that self-supply should be advanced. Social mobilisation also formed a core approach. Prior to the widespread installation of pumps infrastructure in the region, mobilisers were employed to train the people in maintenance as well as good sanitation practices. Moreover, they were tasked with building community support and consensus regarding the assistance of external NGOs.
2. **Data collection**. Research was conducted to find optimal sites for self-supply infrastructure. Environmental circumstances, community size and need were all gauged to ensure appropriate locations were found and relationships developed.
3. **Provision of technical support**. The primary means of assistance entailed knowledge transfer to local people. This was coupled with sourcing and strengthening affiliations with local markets and tradesmen in supplies for the infrastructure. The approach was designed to enable an early withdrawal from the region to facilitate a self-sustaining project.

*Lessons Learned and Recommendations*

Overcoming the recalcitrance of locals vis-a-vis collaborating with local government was a significant challenge and must be considered a likely obstacle when government discourse views self supply as counterproductive to development progress. Advocacy is thus critical in establishing collaboration on self-supply between multiple stakeholders. Such projects depend on a reliable source of funding since a number of elements are inherently medium to long-term (e.g. behavioural change). In this project in Uganda, the funding limitations reduced the capacity for local government to become fully involved in the life cycle of self-supply development. This partly explains the primarily informational and supervisory role played here. The authors of this project paper recommend that partnerships be made between local governments and NGOs. Such collaboration would enable role narrowing whereby each agency would organise a particular aspect of the project. The outcomes of the above project support such a strategy over single actors performing multiple roles.

Effective monitoring of the outcomes of the self-supply initiative has not been conducted to a satisfactory level. This has led to general recommendations as opposed to refined ones borne on analyses of specific aspects of the project over time. From this, it can be asserted

that post-pilot monitoring is imperative, whether success or failure, as this can inform decisions in the future more effectively.

**MALI**

**Case Study 5**: Report on Private Initiatives – Study of Self Supply in Koulikoro Region,

**Organisation**: WaterAid, Ministry of Health (DHPS)

**Author**: Sutton *et al.* (2009)

*Approach*

A primary focus in Mali was the improvement of sanitation. The supply of clean water in Mali is grossly inadequate. Therefore, a four-pronged approach was taken.

1. Mason training to facilitate self-sufficiency.
2. Effective demonstrations of technologies to promote copying across communities.
3. Chlorine/ other disinfectant provision. Either naturally (e.g. UV) or market sourced.
4. Techniques for good sanitation practice transferred, sanitation monitored by neighbourhood authority (e.g. ASACO) and funded by micro-credit schemes.

Cascade training was used to spread the understanding of techniques for construction, maintenance and sanitation management associated with wells in Mali. A strong advocacy approach was taken to persuade the sanitation department of the Malian government of the value of preventative infrastructure and the comparable water quality of self-supply vis-a-vis communal supply.

The projects in Mali are predicated on a concept of facilitating self-help so that incremental improvements can be made upon the withdrawal of external assistance.

*Lessons and recommendations*

The nature and extent of future support for self-supply needs to be fully defined before future piloting is conducted. It will establish how best to manage the cultural specificities of particular target populations. Moreover, it will expedite the process of copying and incremental improvements if support structures are understood in advance of intervention.

A key lesson from the projects was that success (in terms of how widely the principles spread and were embedded in cultural norms) was dependent on the level of understanding of the project's intentions. Variability in such understanding across the country tracked the extent that training proliferated and improvements were made, in both well quality and sanitation practices.

As is mirrored in every self-supply project across the continent, performance cannot accurately be evaluated without a comprehensive monitoring study associated with each project. The absence of baseline quality and access data in the Malian projects means that assertions about improvements have only limited validity. Thus, any future project must factor in a rigorous analysis of ex ante water supply attributes, with an ability to continue monitoring water output and the less tangible notion of cultural norms. A longitudinal study, possible conducted by the local government, would therefore provide more robust lessons that would be transferrable to other such projects.

**ETHIOPIA**

**Case Study 6**: Universal Access Plan (UAP) and Self Supply, Oromia Region, Ethiopia

**Organisation:** Government + NGOs

**Author:** Workneh *et al.* (2009)

*Approach*

The first stage of the self-supply projects undertaken in the Oromia region post-2000 has been training in building and maintenance and the provision of written guidance and information concerning best practices and upgrade techniques to the communities. Another important part of the approach is the support given to communities in monitoring water quality, pump condition and behavioural norms. The Oromia region experimented with innovative techniques for water lifting and well protection. Funded by the Japanese International Cooperation Agency (JICA), a pilot project was run that used rope pumps to lift water from wells. Combined with the supply innovation, which was made possible by external funding, there was a strong focus on advocacy for self-supply to the local government. The challenge of scepticism regarding self-supply was seen as a critical barrier to be overcome if the project was to be sustainable in the long-term – only with government support would it be possible to spread the concept of self-supply effectively. The authors assert that the agencies in the Oromia region have been more organised and systematic in their approach to self-supply than elsewhere. This has led to a more extensive and dense (per capita) network of protected wells than in other parts of the country.

*Lessons Learned and Recommendations*

The authors' analysis of self-supply in the Oromia region of Ethiopia can be distilled into the following lessons and recommendations:

1. Local attitudes towards self-supply must be predicated on a conception of it as a positive step in development. The government's UAP is at best a slow moving, long-term ambition so the advancement of self-supply as a realistic approach to universal access and sanitation is central to future projects. As such, evidence comparing water quality and use of self supply sources and communal ones should be presented to negate misconceptions.
2. As is the case in other countries and projects, the importance of case specificity – climate, water abundance, cultural norms, community size/ demographic – must be recognised. The success of one technology in Oromia does not necessarily make it the optimal one elsewhere.
3. Communities are sensitive to water quality changes. If the arrival of externally supported self supply infrastructure does not lead to reliable high quality water, this may lead to a loss of confidence in such projects. Thus, the training of workmen and focus on build quality is paramount to project sustainability.
4. Self-supply needs to be supported and ultimately funded by endogenous sources. The UAP would be more realistic if it incorporated self-supply into its methodology. Effective advocacy would develop the linkages between local government and small communities – the projects in Ethiopia reflect the association between government support and the rate that communities improve their supply infrastructure.
5. Household Water Treatment and Safe Storage (HWTS) must be promoted to communities engaging in self-supply. Inculcating principles of healthy behaviour and efficient water usage are important conclusions and recommendations; however, they should not be requirements to be considered for NGO assistance.

**ZAMBIA**

**Case Study 7**: Luapula Province

**Organisation:** UNICEF, WaterAid, Development Aid from People to People (DAPP), RWSN

**Author:** Sutton (2009)

*Approach*

The two organisations operating in this province have adopted subtly different approaches to fill different gaps in the development of a self-supply enabling environment. DAPP has

focussed on skills acquisition and incremental improvements to facilities at the lowest possible immediate cost. The result was that behavioural change and basic improvements in well protection were prioritised. DAPP strongly promoted the idea of autonomy on the basis that ownership improves maintenance, investment levels and improvements. DAPP asserted that installing basic technologies (rope pump) and making limited improvements to well protection were the optimal use of limited funds. Moreover, such an approach would encourage further investments by the owners. A baseline survey ex ante of intervention was conducted to more effectively establish criteria for success and thus rationalise expansion across the country.

WaterAid, by contrast, engaged in training of artisans and masons in the construction and maintenance of fully protected concrete ring wells. The aim was to develop access to necessary skills so that unsubsidised improvements can be made in the future. Conspicuous well improvements were made in a few sites to act as models to be copied by surrounding communities. An effort was made to connect communities to suitable financing mechanisms to facilitate the copying process. As with DAPP, a baseline survey was conducted to evaluate pre-improvement conditions and explore the best ways to achieve household chlorination.

*Lessons Learned and Recommendations*

A significant conclusion from the projects is that satiating demand for improved supplies and the subsequent provision of a spare parts network is an effective means of gaining rapid community support. Moreover, the key contrast between self-supply and communal is the sense of ownership. Adapting the approach to take advantage of the underlying power of autonomy helped to expedite the improvements made. The ability of financially able community members to act as pioneers in technology adoption is indicative of the of the NGOs' role in facilitating ownership.

The experience and autonomy of the NGOs involved enabled high level of project tailoring. The pilot projects revealed the type of technologies and funding mechanisms that would best suit the communities in Luapula. As was the case in other case studies, the unique circumstances of each community necessitated a particular arrangement of project foci to make sustainable self supply feasible.

Private initiative proved to be a valuable component of the projects. The role of communities collaborating in self supply is commonly touted as vital. However, in the Luapula case, the opportunity for skilled people to develop their entrepreneurial ventures proved useful in expediting the improvements and elevating workmanship quality.

Another important lesson from the Luapula projects was the need to foster a culture of incremental gains rather than transformative investments. The motivation to engage in improvements was strongly tied to the perception of affordability and value. Sutton (2009) argues that the creation of a market, a chief goal of self-supply, happens when a large

number of people are encouraged to improve their supplies and there is a competitive construction industry.

A major limitation to the performance of the projects is communication between different agencies. Both the telecommunications and transport infrastructure in Zambia are intermittent and incomplete in remote areas. Therefore, it is imperative that proper solutions are devised in advance of any large scale collaborative project between NGOs and government in self supply. The training programmes run by the NGOs in Luapula faced overlap and lack of coherence such that dissemination of information was at a sub-optimal level. As such, there needs to be an evaluation of all the organisations involved in rural development projects. This would facilitate the establishment of transparent, inter-organisational project management, thereby maximising the productivity of each NGO. The benefits for self-supply would derive from a clear understanding of the roles of each agency in every step of the process.

Sutton (2009) identifies a flaw in the projects in Luapula that is ubiquitous across self-supply internationally. A perfunctory approach to monitoring and evaluation hampers the validity of conclusions about improvements. A systematic procedure for monitoring should be established so that various aspects of self-supply – water quality, output, number of users per well and costs – are measured. This would permit complete cost-benefit analyses of potential improvements as well as benefitting future project design.

**SIERRA LEONE**

**Case Study 8**: WASH Self Supply

**Organisation:** WaterAid, Welt Hunger Hilfe (WHH)

**Author:** Gelhard (2014)

*Approach*

The focus of these NGOs in Sierra Leone was the formation and/or support of a self-sustaining private market in WASH sector infrastructure and services. As such, the approach was designed to maximise the potential for rural communities to become integrated with local and more distant markets. WaterAid sought to inform willing communities and local government agencies about the optimal strategies and guidelines for accelerating private investment and improve the standard of supplies. It conducted evidence-based research as

well as advocacy to gauge the business environment in the region as well as the potential for self-sufficient markets to emerge in self-supply. WaterAid's pilot project focussed on communities relying on unprotected water sources to evaluate how marginalised and low-capacity groups could gain access to investment and capital.

WHH's approach centred upon testing EMAS (a German NGO) low-cost water supply technologies for appropriateness in two districts in western Sierra Leone. A technology piloting program was combined with a training initiative to facilitate the growth of a self-employed group of technicians who could sell, install and maintain the EMAS water technology. Private demonstrations of the technology were made across the region to promote the viability and benefits of upgrading.

*Lessons Learned and Recommendations*

Owing in part to a lack of financial capacity, less than one third of adopters of self-supply in rural Sierra Leone have access to protected water supplies. As well as the capacity problem, there is clearly an awareness deficit among communities and local government of the array of ways that self-supply could improve livelihoods. There has been a focus by government to improve and broaden communal supplies since 2000. However, the limited resources have hampered efforts to achieve even universal urban coverage. The relatively basic awareness of, for example, the requirements for a self-supply private market, represented one of the key challenges to the NGO projects under evaluation. Informational campaigns proved as important as technical and labour assistance.

Self-supply projects in Sierra Leone must evaluate a range of technologies for each situation to maximise the various benefits that can accrue. The reliance of WHH on EMAS technology may not be the optimal approach since it was not tested in pilot studies across the country; the pilot is crucial for determining which technologies align best with specific conditions as well as the local manufacturing capabilities and resources.

Any project that intends to enhance self-supply must account for the poorest groups. Affordability is essential for attracting investment in self-supply. As the Sierra Leone case shows, communities will tend to expect long-term NGO support in capital provision unless a robust financial rationale is provided. This entails more than simply affordability; the perception that sanitation improvements are not a welfare priority, especially compared to water supply, is a common finding. Gerhard therefore argues for practical demonstrations of the importance of sanitation to account for this.

Another area of weakness in self-supply infrastructure in Sierra Leone is the lack of community capacity to invest upfront capital, for example in self-supply upgrades, which is required to establish a network of businesses in the sector. Future projects must organise communities and agencies to collaborate in infrastructure investments. Not only will pooling

financial resources increase purchasing power, but it will also heighten the sense of ownership over new services.

There is a critical knowledge and research deficit within the Sierra Leone government on the array of means available to manage the issue of water supply. A major obstacle to garnering government support for NGO projects is the shortage of concrete evidence detailing the appropriateness of technology in particular regions. Additionally, NGOs operating in Sierra Leone need to produce reports on the trends in the self-supply technologies and best practice so that government decision-makers can authorise funding and other resources effectively.

Perhaps the most significant lesson, owing to its ubiquity across self-supply projects, is that quality control (e.g. of construction, parts, training, water quality) is by no means innately associated with a self-supply upgrading program. The propensity for materials and build quality to come in a "bandwidth" (p.8, Gerhard, 2014) affects water quality consistency as well as damaging the reputation of the concept of self-supply in the public perception. Expediting the uptake of self-supply is heavily reliant on strong demand and the prospect of improved welfare, therefore systematic steps must be taken to ensure that quality is maximised in every NGO-assisted project. This should take the form of regularised (over time) monitoring by local councils (capacitated by the NGOs) to ensure that self-supply projects are complementing rather than competing with communal water services. Moreover, building such procedures strengthens accountability in terms of workmanship (and sanitation issues resulting from poor construction) and transparency, which as highlighted by another scheme in Uganda, is imperative to augmenting collaboration in self-supply.

**HONDURAS**

**Case Study 9:** EMAS Hand pump

**Organisation:** German Development Bank (KfW), Honduras Social Investment Fund (FHIS)**,** Swiss Agency for Development and Cooperation (SDC)

**Author:** Water and Sanitation Program (WSP) (2004)

*Approach*

One self-supply approach adopted in Honduras is based around the EMAS pumps. These small, low-cost and low-maintenance systems have proven effective in these environmental circumstances and are primarily designed to serve single households. The pumps are produced from local materials and are frequently installed in homes. FHIS initiated their project by organising manufacturing and maintenance training and combined this with the establishment of regional water boards to subsidise maintenance costs. Additionally, in an

effort to protect water quality, chlorination banks and moderate cost solar sterilisation technologies are available around the country.

The other approach is the rope pump. The immediate acceptance of rope pumps in rural Honduras facilitated the rapid establishment of a private market for their construction. A single supplier produces all such pumps in Honduras, in contrast to El Salvador and Nicaragua, which have competitive markets. The appeal of this design, in contrast to the EMAS, is the flexibility in terms of size, which allows it to serve large communities.

*Lessons Learned and Recommendations*

The report by the WSP makes overall positive conclusions about the performance and outcome of self-supply programs in Honduras. The analysis of the two pump designs employed in the country suggests that a widespread and effective installation program has occurred such that the majority of people have access to a cheap and reliable water supply. Two implications come from this. First, this article was written in 2004; population growth, economic development and the condition of the infrastructure are all likely to have changed since then. Thus, assertions about long-term performance are tentative. Second, it does not explore the weaknesses in the program, nor does it detail the roll-out strategy to a level that enables copying elsewhere. As a result, the following points are only cursory indications of how to improve such a project.

1. Any project must be tailored to the specific demands (needs) and capabilities of the target population. Enacting a project based on an advanced technology which has both high initial capital costs as well as limited possibilities for repair is likely to fail.
2. The two pump approach succeeded in meeting the needs of both average sized communities and remote, comparatively isolated households. Moreover, the suitability of each pump for particular conditions meant that pre-installation analysis could be conducted to identify which design would be best.
3. Part of self-supply project design should be a comprehensive understanding of the parts supply chain. The sustainability of pumps in remote areas depends upon knowing where to acquire spare parts/ contact skilled workers. The EMAS design excelled in Honduras because all parts were readily available to even the least affluent people.
4. All well installations must be accompanied by a complete training protocol for sanitation and hygiene. While a properly installed well will produce clean water, the risk of contamination is elevated by poor hygiene practices. In a tropical latitude country like Honduras, the Solar Disinfection (SODIS) method has proven effective at providing rapid decontamination of stored water. Imaginative approaches to decontamination should be explored elsewhere.
5. Poverty reduction should be the overarching goal of any self-supply project. As such, issues of economic capacity, potential for profit, for example from agriculture, and

positive lifestyle changes, should all be addressed. This will ensure that such a project enhances the prospects for prosperity.

**BOLIVIA**

**Case Study 10:** EMAS pump report

**Organisation:** RWSN

**Author:** MacCarthy *et al.* (2013)

*Approach*

The EMAS approach in Bolivia has focussed on the concept of 'adding value' to the livelihoods of target populations. This effect is gained by having water piped into the house from the pump as well as other concomitant lifestyle changes that may lead to improved welfare. The strategy of pump installation and lifestyle change is primarily implemented through technical training subsidised by EMAS around Bolivia. Additionally, EMAS exploits both internet and TV coverage to broadcast information about its pumps and ways to improve sanitation. This is effective because, compared to some African examples, TVs are widespread. EMAS asserts that the incentive to maintain the higher level of water service, as provided by EMAS infrastructure, would help to ensure that households quickly repair any faults in the facilities and not revert to alternative supplies.

*Lessons Learned and Recommendations*

1. 78 of 79 households that were inspected during the research process had fully functioning EMAS pumps. This indicates that both the reliability of the design and the potency of the incentive to maintain it are intact in Bolivia.
2. The running costs of the EMAS design are below the affordability threshold for most households in Bolivia. The wide usage of EMAS pumps is partly due to a tailoring of the design to meet the affordability criteria of the people as well as the provision, across the country, of associated supplies that would ensure longevity.

**Conclusion**

Each case study referenced here has been distilled to display approach, lessons and recommendations in a systematic manner. The contrasting styles and emphases across the studies have been muted to facilitate easier extrapolation. However, the differences are not insignificant and demand an overall observation about self-supply case studies. The difference in the way each outlines an organisation's approach reflects a lack of coherence across the sector in the monitoring and dissemination of information. This shortcoming may

hinder intra-sector learning and dialogue and thus reduce the uptake of innovative ideas that would enhance self-supply prospects. Therefore, a concerted effort should be made to refine the case study approach so that it systematically analyses projects globally. The more effective use of a database, for example the RWSN, by a wider research pool, would further enhance the capacity of organisations to develop evidence based policies.