# Self-supply family wells for Multiple Use water Services

## Case studies of multiple use of water in Ethiopia (MUStRAIN case 2)

*As part of the MUStRAIN project in Ethiopia, various approaches to water harvesting, multiple use of water and ecological sanitation have been studied. Here the potential of family wells is discussed.*

### Family wells in Ethiopia at a glance

**Main features:**
Family wells are privately-owned, although generally shared freely with neighbours for domestic use. Traditional hand-dug wells come in a variety of shapes and sizes according to local geology, material availability and know-how. They can be upgraded by stepwise improvements in lining, well head protection and lifting devices.

**Implementation:**
Family wells are promoted under the Self-Supply Approach promoted by the Ministry of Water, Irrigation and Energy and under the household irrigation strategy of the Ministry of Agriculture with its 'one family, one well' target. Family wells are usually dug by the owners, and all other costs borne by the household. Subsidies for hardware are avoided.

**Options for multiple use of water**:
Households use their family wells for a range of purposes This includes household irrigation, livestock watering and domestic uses.

**Challenges for uptake**:
Most improvements of the family wells increase water quality, safety of the well, convenience and water availability. Technical advice on how to upgrade existing wells is not easily accessible to households, nor is financial support.

### Introduction

Self-supply is an improvement to water supply services developed largely or entirely through user investments, usually at household level. Having a well and sharing it among relatives and the neighbourhood is an old practice in some areas. Family wells come in many shapes, depths, technologies and water sources. The most widely used self-supply facility in Ethiopia is the privately owned family well, usually dug by hand. The wells are installed with different lifting mechanisms such as rope, pulley and bucket, and rope and washer pumps. Self-supply gives the owner the opportunity to incrementally improve their household water supply, depending on the financial capacity and requirements of the household. Incremental improvements such as a different way of construction, improved construction materials, well head constructions, or lifting devices, would enhance convenience, water availability and water quality. It is similar to a ladder where users of the facility can step on the bottom of the ladder (in this case the simplest traditional well) and climb up higher (e.g. adding a motorized pump)[a].

### Implementation

The prime motive for having your own well varies from place to place depending on the livelihood of the users. In pastoral areas, the well would be largely for livestock watering and domestic use. In areas without adequate communal water supplies, it may be primarily for domestic uses followed by animal watering, especially for young and weak animals that cannot travel far for grazing or watering. Irrigation of vegetables, fruits and nurseries at home gardens may then be third

[a] More on this in MUStRAIN case study 3 on mechanized pumping.

priority[1]. In other areas, particularly zones of high value crop production and areas close to markets, household irrigation is the major driving force for shallow groundwater development with drinking and domestic supply being secondary.

Implementation by definition is in the hands of individual households or groups, self-initiated and with very little, if any, direct support. It looks like the copying mechanism that historically replicated the use of family wells within the society – long before government or NGO intervention. People have always needed water, for drinking and other domestic purposes as well as for income generation. In 2004/2005[b] the government rolled out a family well construction campaign in Oromia region.

More recently both government and NGOs have started initiatives and support to promote family wells through training, advocacy and promotion at different levels. Interestingly, at government level this involves two sectors. Family wells are promoted under the Self-Supply Approach promoted by the Ministry of Water and Energy, as well as under the household irrigation strategy of the Ministry of Agriculture with its 'one family, one well' target. The government has thus created a conducive environment for promotion and implementation of family wells, household irrigation technologies and Multiple Use water Services. The Ethiopian government further tries to support self-supply by establishing markets and supply chains.

**Design of family wells**

Wells vary in shape from cylindrical through rectangular to irregular shapes. The irregularity is usually attributed to soil conditions, risk of collapsing and the well digger's experience. Wells can be without lining, be partially lined or fully lined using a range of materials, varying from locally available material such as adobe mixed with straw, to industrial materials such as concrete rings. Similarly, head works vary from simple soil bunds, via well-compacted clay soil bunds and wooden riprap on top of the well mouth, to concrete-made aprons with parapet.


**Figure 1.** Unlined family well with head protection.

**Figure 2.** Family well lined with wood.

[b] All dates are noted using the international (Gregorian) calendar.

**Figure 3.** Family well lined with stone masonry.

The materials and technology used vary from place to place and seem area-clustered. Traditional family wells in Amhara, Oromia, SNNPR and Somali regional states vary at least in one component of the wells; either in way of construction, head works, lifting mechanism and type of materials used for construction. In Oromia it highly varies from one area to the other; e.g. in pastoral areas traditional wells are communally owned by clans, with very strong management, such as the *ela*, traditional wells of the Borana people.

Traditional water lifting mechanisms include scooping by hand (depending on depth to water level), direct rope and bucket and pulley systems with buckets. Buckets can be made from cans of cooking oil, car tubes or plastic jerry cans. Recently, intervention of the government and some NGOs has brought in rope and washer and other pumps.

**Multiple uses of family wells**

Our assessment of self-supply in Oromia, SNNP and Amhara regions shows that family wells are used for various purposes: drinking, cooking, washing and other domestic purposes, plus cattle watering. It seems that the more the wells are owned on private or family basis, the better the opportunities to use the facilities for multiple purposes, as people can determine for themselves what they want to use their own water for. This is usually not the case with communal supply, which can be attributed to various factors. These include the supply-demand gap embedded in the design capacity of community water supply (15 lpcd[c] in rural Ethiopia), the difficulty to transport large quantities of water over long distances for irrigation or other bulk uses, and risks of contamination when all livestock are watered at the communal supply. Hence, family-owned wells are more commonly used for multiple purposes than the communal sources[2].

In the SNNP region, apart from domestic uses, a study found that 85% of the traditional family wells are used for animal watering and 30% for irrigation, whereas 54% of the family wells with rope pumps are used for livestock and 43% for irrigation[2]. In Oromia animal watering from traditional wells -constructed and used primarily for drinking- varies between 15 and 63% and irrigation use varies from 6 to 40%[1].

**Figure 4.** Cattle watering using a traditional well in Fogera district, Amhara region.

[c] lpcd = liters per capita per day.

**Figure 5.** Banana irrigated from traditional family well in the Fogera district, Amhara region.

Having a family well not only allows for productive uses; it also helps to diversify both production and income generation. In SNNPR 63% of the families were able to produce different crops after constructing their own well and 67% kept more animals respectively[2].

**Figure 6.** Chili seedlings, Meskan district, SNNPR[3].

**Water quality**

The majority (80%) of users of family wells perceived that the water is safe to use for drinking[4]. However, many traditional wells are in fact poorly protected and provide unsafe water[5]. Others would prefer to use other sources but do not have any alternatives nearby (17%), find those too expensive (2%), or have no other options at all (1%). More than half (54%) of the respondents when asked wanted to make some adaptations to their wells that can improve water quality, such as cleaning, well head protection, or lining. Less than half of the households (42% in SNNPR and 47% in Oromia) never treated their water at home. Only 7-8% used chlorine or boiling as water treatment[4].

**Costs and benefits**

The costs of family wells vary across the country depending on many factors. Particularly, the initial investment cost (capital expenditure) depends on the level of service of the facility, i.e. the position on the self-supply ladder.

For traditional family wells the initial investment costs (labour, material & lifting device) were around € 50 (ETB 500) in SNNPR during the 1990s; nowadays it can be around € 105 (ETB 2500)[2]. In Haramaya and Kombolcha districts (Oromia region) traditional wells cost up to € 285[d], of which more than 65% is the material cost. In these two districts, well owners invest much on concrete for internal lining and well head protection.

As the family wells are fully owned by a family, the operation costs are mainly the labour of the water drawer and transportation to point of use. The common maintenance for traditional wells is cleaning after every rainy season. Owners either hire external labour to do this or do it themselves. The major capital maintenance of the traditional wells is replacement of rope and bucket. Buckets are often made from cheap local materials and rope can be produced from locally available materials as well, or purchased, such as nylon or rubber.

[d] Conversion rates according to xe.com, March 2013 (€ 1 ≈ ETB 23.9).

An average of 15 years life span can be considered for family wells. Half of the surveyed traditional family wells in SNNPR were more than ten years old[2] and several wells can yield water for as long as 40 years.

**Challenges for up-scaling**

A major concern in the up-scaling of family wells is water quality[6]. Generally, in rural water supply programs, protected wells, closed with a pump, are recommended for drinking. However, traditional wells can be upgraded to improve the water quality, e.g. by lining and protecting the well opening from surface inflow. Alternative lifting devices such as rope pumps can reduce water contact and thus lower the risk of contaminating the water. Household water treatment and storage can also be promoted.

Many owners are interested to further develop their family well, but have no access to the technology for improvements[6]. They need technical advice and sometimes access to credit. Additional service provision by government agencies and donors could help in such technical and financial assistance. Recently some NGOs started to facilitate credit services for household irrigation technology such as rope and treadle pumps. However, an obstacle in this is that most organizations to date are aimed at investments in new water supplies and supporting step-wise upgrading funded by the users themselves, is a major challenge.

**Conclusion**

With the right support, many existing family wells could be upgraded to provide supplies that are better for productive and domestic uses (especially more quantity) and drinking (better quality). This support should keep ownership at the household and improve the convenience, safety (both in terms of water quality and collapsing) and potential benefits of the well. Increased availability of water thus enhances the potential for multiple uses. This potential is high, as the more water systems are owned on private basis, the greater the opportunity to use them for multiple purposes.

**The MUStRAIN project**

The goal of the MUStRAIN project is “to address the critical water problems in water scarce rural areas of Ethiopia by collaboration, implementation of innovative and alternative solutions and exchange of knowledge and mutual learning”. Scalable approaches to water harvesting (RWH) and shallow groundwater development (Self-supply) for multiple use services (MUS) have been the focus.

MUStRAIN brings together the strengths and builds partnerships of a consortium of Dutch-based organisations (IRC International Water and Sanitation Centre, RAIN Foundation, Quest and Water Health) and Ethiopian partners and experts with complementary interests in the sustainable development of approaches to MUS. MUStRAIN is led by IRC and funded by the Partners for Water (PvW) programme.

MUStRAIN aims to promote uptake of Multiple Use Services in different contexts within Ethiopia, by documenting replicable water access/MUS models. In eight case studies cost-benefit relations are analysed, as well as opportunities and challenges for implementation.

The MUStRAIN case studies are:

1. MUS from sand rivers
2. MUS and Self Supply
3. Mechanized pumping and MUS
4. Ecological sanitation for MUS
5. Greywater reuse for MUS
6. MUS and livestock
7. MUS and the Community Managed Project (CMP) approach
8. MUS and manual drilling

The current case study (2) is based on the recent publications of research conducted in the country on self-supply family wells, complemented with the first author's experience in this field.

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The IRC International Water and Sanitation Centre is a knowledge-focused NGO working with a worldwide network of partner organisations to achieve universal access to equitable and sustainable water, sanitation and hygiene (WASH) services. IRC's roots are in advocacy, knowledge management and capacity building. IRC was set up in 1968 by the Dutch government on request of the World Health Organization as a WHO Collaborating Centre. Currently, IRC is established as an autonomous, independent, not-for-profit NGO with its Headquarters in The Netherlands, and local representation in the countries where IRC implements programmes. IRC has profiled itself over the years with innovation and action research to achieve equitable and sustainable WASH services.

In collaboration with:

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