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REACH Water Security in Fragile Environments Observatory

Summary research report REACH IRC

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Supporting water sanitation and hygiene services for life

Contents

This Summary research report has been produced as part of a research activity for the Water Security in Fragile Environments observatory of the REACH programme. REACH is financed by DFID through Oxford University with this activity implemented under the auspices of the Water and Land Resource Centre (WLRC) of Addis Ababa University. The research is being undertaken in two watersheds (Aba Gerima and Debre Yacob) in two districts (Bahirdar Zuria and Mecha) of Amhara National Regional State of Ethiopia.

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Abbreviations

ETB	Ethiopian Birr
JMP	Joint Monitoring Program
KII	Key Informant Interview
MPN	Most Probable Number
SLM	Sustainable Land Management
WLRC	Water and Land Resource Centre

Executive Summary

This report summarises research that IRC has been conducting from 2017 to 2020 under the REACH programme in two watersheds in Amhara, Ethiopia. The research question has been *"How do sustainable land management programmes relate to interventions promoting groundwater utilisation, and how can the benefits of groundwater development for the rural poor be secured and maximised?"*

Category	Activity	Period
Assessment	Baseline	May 2017
Due to state of emergency, activities were halted 2017/2018		
Well upgrading process	Community meetings and service provider assessment	October 2018*
	Repeat family wells survey and water quality test	December 2018-January 2019
	Demonstration sites setup for well head improvement	February-March 2019
Monitoring phase	Water quality monitoring	June – December 2019
	Water level monitoring	June– March 2020
	Focus Group Discussions	March 2020

As presented in the table above, three main activities were conducted to address the research question. This assessment showed that within the sustainable land management programmes there is willingness and ability to make well investments, with many wells being constructed by families. The main driver for this is irrigation, but once present, many sources double up as domestic source as well, with 40% was using their irrigation wells for drinking.

The well upgrading process was informed by the self-supply acceleration planning (MoWIE, 2014; Butterworth, et al., 2014) and a semi-protected family well was promoted as part of the water technology ladder. However, the results of the uptake of these semi-protected wells has been disappointing with just 5 wells were improved, against the anticipated 80. This has hampered the sample size for the monitoring phase. Arguably, the demonstration sites should have been ready well before the dry season, to allow quicker uptake. Also, some aspects such as assumptions that improved wells are harder to clean, that everybody would get well upgrades for free and that previous projects left them de-motivated could have been captured earlier.

The monitoring phase showed that securing water quality in the area has not been achieved, with even the improved wells having high risks. More than 90% of the population face high or very high water quality risk based on the E-coli measurements. This shows the need for linking with household water treatment initiatives and a recommendation is to develop one approach of household-focused development combining sanitation (CLTS), irrigation, well improvements and water treatment. Better alignment between the agriculture and water sectors is therefore recommended. Also, the evidence suggests that well improvements are not happening easily even in (or because of) areas with intense existing land management programmes and if uptake within a relatively short time is pursued, significant subsidy or other forms of support will be needed.

1 Introduction

This summary research report was prepared as part of the research IRC has been implementing on 'Groundwater Development' as part of the observatory research programme REACH. It focusses on the closing activities of 2020 and builds on previous reports – baseline 2017 (Mekonta, James, & Butterworth, 2019) and interim research report 2017-2019 (Naafs, Lemessa, & Butterworth, 2020).

1.1 Context

According to JMP (JMP, 2019), only 31% of the 84 million people in rural Ethiopia have access to at least basic drinking water services. Following the historical trend of 1% improvement per year, it will still take a long time to have communal protected water sources near all households. In the interim, 23 million people (28%) resort to unimproved sources, with a total of 4.8 million (4.5%) of the rural population still depending on unprotected shallow wells.

Since 2009, the water supply policy of the Ethiopian government has given more emphasis to lower cost of technologies and the self-supply approach in rural areas. self-supply was included in the 2013 One WASH National Programme phase I, leading to a Manual for Accelerating Self Supply Programme (MoWIE, 2014). Though the second phase of One WASH is targeted to professionalize rural water supply, other modes of implementation such as self-supply remain in place and 4,366 schemes are included in the planning for 2018-2020 (Federal Democratic Republic of Ethiopia, 2018).

Compared to basic and improved access, the unprotected wells and what drives their users to invest is relatively under researched, though research shows that they can have a complimentary role to achieve SDG 6.1 (Sutton, 2009).

1.2 The project

The aim of the Water Security in Fragile Environments Observatory in Amhara, Ethiopia is to evaluate the contribution of Sustainable Land Management (SLM) practices to water security in fragile ecosystems and to share results for evidence-based upscaling. There was limited prior assessment of the groundwater resources within these learning watersheds or understanding of the dynamics of groundwater utilisation. However, shallow groundwater development forms a critical component of government policies and strategies in both agriculture (e.g. the household irrigation programme) and rural water supply (self-supply).

Figure 1 Location of study area

IRC have been implementing an activity on 'Groundwater Development' as part of the observatory research programme. Working closely with The Water and Land Resource Centre (WLRC) of Addis Ababa University which leads the research observatory, activities took place in two learning watersheds (Aba Gerima and Debreyakob located in the districts Bahir Dar Zuria and South Mecha respectively).

1.3 Research questions

In the two selected learning watersheds, this research focussed on understanding the groundwater component of the water balance by investigating the following:

How do sustainable land management programmes relate to interventions promoting groundwater utilisation, and how can the benefits of groundwater development for the rural poor be secured and maximised?

Further sub-research questions are:

1. What are the drivers behind investment in groundwater development by families for agriculture (household irrigation) and domestic (self-supply) uses, the existing performance of these facilities and the pattern of sharing of benefits?
    1. Are wealth, gender and education key determinants influencing investments and benefits?
    2. To what extent do access to inputs (technology, finance), information & markets influence investment?
    3. Are sustainable land management programmes directly or indirectly influencing investments in groundwater and utilisation?
2. What are the existing risks (and practices to reduce or mitigate risks) related to use of unprotected-or semi-protected water sources at household level, and the unregulated or uncontrolled utilisation of the groundwater resource at the watershed level?
    1. What are the water quality risks associated with family wells, and current mitigating practices and behaviours of households?
    2. To what extent are available groundwater resources being utilised, and what is the potential for further development?
3. How effective are low-cost interventions (improved well head protection and lifting devices) in reducing risks associated with family wells?
    1. does installation and use of such technologies improve water quality for drinking and minimise risks?
    2. What are the costs, and critical conditions for wider upscaling of interventions to increase supply, demand and improve the enabling environment?

1.4 This report

As this report is a summary of the research as a whole, chapter 2 summarises the activities up to November 2019. Chapter 3 presents the closing activities of the Focus Group Discussions and the final monitoring. Chapter 4 presents the main findings of the research and the final chapter of the report contains discussions and recommendations.

2 Summary of activities

2.1 Baseline

In 2017, a complete inventory of all 570 family wells and the 19 community wells within the two watersheds was conducted. This covered well characteristics (e.g. depth to water level, well depth), technologies used in well construction and water lifting, reliability, use and satisfaction, sanitation around the well, and hygiene in handling water. Furthermore, the well-owner or another member of the family was interviewed to obtain family characteristics such as age, education level, number of family members and area farmed. The detailed results have been published as report (Mekonta, James, & Butterworth, 2018) and a paper has been submitted to Waterlines (April 2020).

2.2 Well upgrading process

This phase was targeted to create sufficient wells with improved well heads and lifting devices to measure the effectiveness of improved well head protection. In order to achieve this, a phased approach was designed, based mainly on self-supply acceleration planning (Figure 2) (MoWIE, 2014; Butterworth, et al., 2014).

Figure 2 Eight steps in self supply implementation

The baseline highlighted that attention was needed particular to demand creation (step 2), technology introduction (step 3), and monitoring (step 8). However, due to the difficult political situation in 2017/2018 and the state of Emergency in Ethiopia, the whole research suffered delay. These were circumstances outside the control of any of the partners and led to a gap in activities between the baseline in 2017 to mid-2018, after which the project continued (Table 1).

Table 1 Key activities well upgrading

Activity	Period	Related to steps (Butterworth, et al., 2014)
Community meetings and service provider assessment	October 2018	• Step 2 and 4
Repeat family wells survey and water quality test	December 2018-January 2019	• Step 7 and part 8
Demonstration sites setup for well head improvement	February-March 2019	• Step 3 and 7

Sutton et al. (2012) found a relationship between level of well protection and water quality risk with semi and fully-protected household wells showing reduced risks of microbial contamination. Based on that approach, the "menu" of technologies, and the demonstration wells, a water technology ladder was designed for use in the research areas (Figure 3)

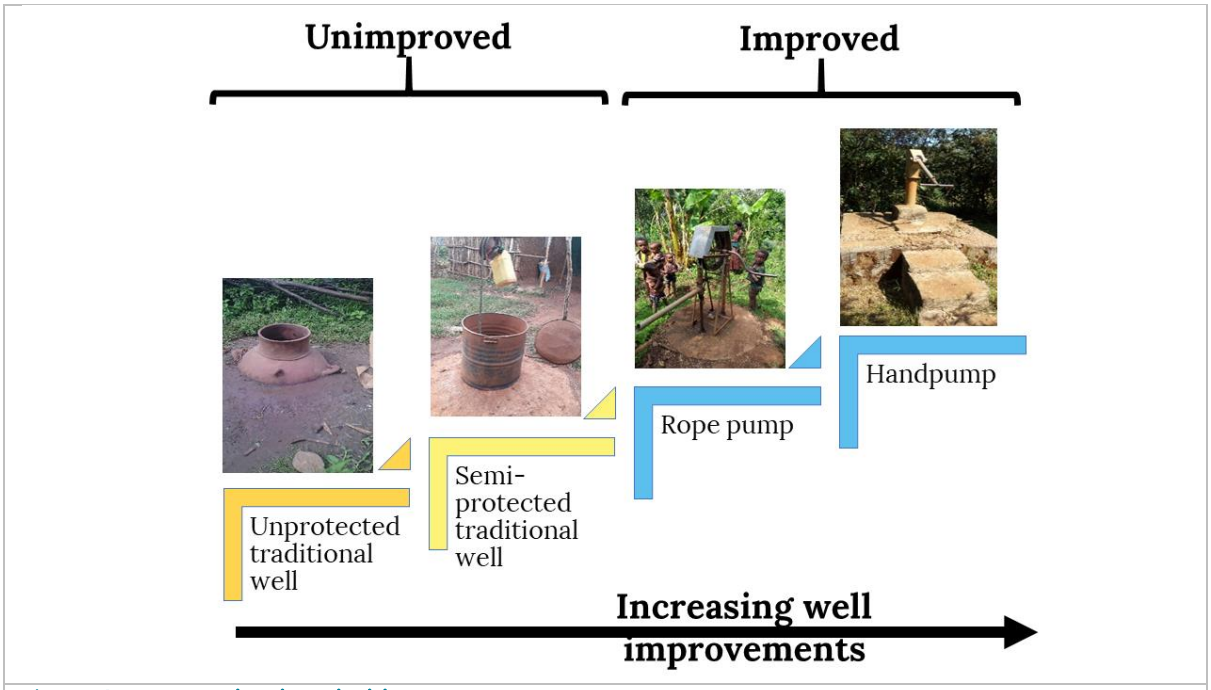

Figure 3 Water technology ladder

2.3 Monitoring

Table 2 Key activities monitoring phase

Activity	Period	Remarks	Total sample
Water quality monitoring by team	June – December 2019	Monthly	155
Water level monitoring by team	June– March 2020*	Monthly	691
Participatory water level monitoring by farmers	June – December 2019	Weekly	168
Monitoring uptake well improvements	June – March 2020*	Monthly	6
Focus group discussions	March 2020	-	2

* Based on the revised call down agreement and extension till June 2020 for submission of deliverables, these were later extended to March 2020.

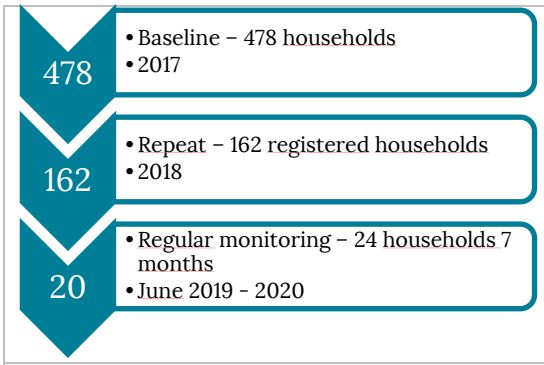

Figure 4 Zooming into monitoring locations

The initial research approach was designed to have 80 semi-protected traditional well that could be monitored every four months. However, due to the extremely low uptake a different approach was designed, focussing on the demonstration wells and comparing those results with handpump improved wells and open wells located near-by. This lead to a selection of 20 water points (Figure 4) of four different technologies. For this a monthly water quality testing programme was set-up, in combination with water level measurements throughout the areas, both in participatory manner and by the field team.

3 Closing activities

3.1 Monitoring uptake well improvements

The field team have been visiting the areas throughout and have had monthly meetings with the farmers, as well as crossing through the area for the water level measurements and water quality tests. They have been keeping note of any improvements on existing wells. No improvements, or request for support were received up to December 2020.

However, this changed in 2020, with 5 wells being upgraded in Aba Gerima (two completed and three ongoing at time of last field visit mid-March 2020) and one in Debre Yacob. According to the observation of the field team, it became apparent that well upgrading only takes place at the end of the dry season (March/April), when the water levels are low, wells can be cleaned, deepened and stabilised. In addition, that is the period when there is not much farm activities on the fields and people have time available.

In South Mecha woreda, where Debre Yacob is located, the water office is making rope pumps available to those households that have upgraded their wells to semi-protected. This is part of the larger initiative of supporting self-supply by the government. While it is in itself a promising development, it is ill at ease with self-supply policy guidelines, which do not allow free provision of rope pumps to individual households. The actual installation is going to be in the new financial year and will be after closure of the research.

3.2 Focus Group Discussions

In order to understand better the limited uptake, focus group discussions were held in each of the watersheds. They were conducted by IRC's Monitoring and learning advisor Girmachew, with the support of the field team (Meles and Mastewal)

The Focus Group Discussion were organised as a free-flowing conversation, using the following as guiding questions:

1) How familiar are they with the well upgrading initiative?
    a) How often have they been involved in any way?
    b) What was the part they appreciated/heard most of?
2) In their opinion, why do they think that well upgrades till date have been very slow?
3) What is their opinion of the demonstration wells?
4) What is their opinion of the costs of the upgrades?
    1) If they didn't know the cost – please let them know the cost is around ETB 2,500 and have them discuss and decide if it is achievable or not.
5) What would motivate them to invest into upgrades in the future?
6) What would they recommend a similar initiative would improve if implemented in other areas?
7) Is there anything else that they would like to say about the initiative?

Table 3 Focus Group discussions

Location	Date	Number of women	Number of men	# Total
Aba Gerima	14th March 2020	2	10	12
Debr Yacob	15th March 2020	0	13	13
		2	23	25

The participation of women in these discussions was disappointing. There is a long-time tradition that men are considered the heads of household and women are responsible for house management, raising kids, cooking etc. There is also a culture that women should not come to public meetings, leadership and conferences. This is a culturally difficult aspect that this project alone has not been able to resolve.

The Focus group discussion was captured in writing by one of the team, and partly by video.

3.2.1 Aba Gerima

1) Farmers in the watershed community are **very aware** of the well upgrading initiative and they communicate with those who has done the well mouth protection/upgrading. They said the demonstration wells are **very good**, farmers recognize that it protects from anything to drop inside and thought that can improve the quality of water.
2) At the same time there were others that said that the awareness created by the watershed technicians was not enough. The farmers said that the problem is that there is **nothing different** from the protection works they normally make using soil.
3) They also indicated that they don't give due attention about the issue/ they don't deeply understand **why** the upgrading has been done.
4) Farmers also explain tradition of the community that they always **look for support** from other organs (government, NGOs etc), and spend own money on other things.
5) They thought the **cost is not high**, but the problem is connected to their planning, with preference given to other purchases like fertilizer, pesticides and seeds. They said that most of the people can afford to do the upgrading, though obviously there are some that cannot do it.
6) They indicated the link with **better health** and said that productions will be low if they are not healthy and that motivates them to upgrade/protect their wells though even then quality is still an issue.

7) Farmers expressed to know the research results and awareness creation, experience sharing, close follow up and supervision from different stakeholders is a recommendation of the farmers to expand it to other areas.
8) Farmers expressed concerns on the **sustainability of the watershed management**. An example is that free grazing is happening now, which could lead the area to go back to previous conditions because extension works are very low with the lack of ownership and low level of follow up and supervision from the government offices,.

Figure 5 Focus Group Discussion in Aba Gerima

9) Finally, they have asked how to get some small **mechanical drilling machines**.

3.2.2 Debre Yacob

1) Community knew about the well upgrading initiative though there are still **some confusions** that it was done for demonstration. There are **still expectations** that the project can do similar for others left out, particular from equity point of view.
2) The **improved water quality** in terms of changes in color, the absence of turbid water, avoiding waste entering the mouth and confidence of the community to use upgraded wells were among the most appreciated from the initiative.

Figure 6 Focus Group Discussion in Debre Yacob

3) Community view towards the demonstration wells is good but upgraded wells were **difficult to clean**, maintain and observe because it is closed in their opinion.
4) One of the main reasons the upgrading has been very slow among others was because of low awareness beyond the presence of demonstration wells. There is **low level of extension** works, follow up and supervision to the others to upgrade it.
5) Most of the farmers **raised technical questions** like well stability problems out of susceptible soil types, unstable and fragile in different areas that hinders them to do the upgrading out of the fear that these wells will collapse. They have got the difficulty to maintain rope pumps installed with the wells.
6) Other similar technologies like biogas development from agricultural development are very slow and **demotivated** the farmers to do the same on upgrading wells.

4 Summary of findings

The findings presented here are collated from the various activities over time and are structured in three sections, one related to each of the sub-research questions.

4.1 Drivers for well construction

Sub-research Question 1: What are the drivers behind investment in groundwater development by families for agriculture (household irrigation) and domestic (self-supply) uses, the existing performance of these facilities and the pattern of sharing of benefits?

- **The initial driver** for construction is **overwhelming irrigation (85%)** with just 10% indicating domestic water use was the main reason. Households that have just one well, typically use it for both irrigation (90%) and domestic use (88%). Domestic use includes washing clothes (66%), cleaning (42%), drinking (42%), cooking (29%) and bathing (11%). There is a huge potential for further well development because more than two thirds of well owners indicate they want to construct (additional) wells.
- **Paying for well construction is not common**. Rather, households mobilize either neighbours and friends or dig and construct their wells themselves.
- The number of private well diggers/artisans ranging between 4 and 6 per kebele. They have **no training on well digging and construction** but learn by doing. The well diggers do not rely on well digging only for their livelihood but have farm land and provide well digging services as an alternative source of income during low agricultural season. A given artisan can get a maximum contract of two wells digging per year as one informant mentioned.
- This illustrates **the small market for well digging services** in the area. Well digging prices vary depending on location, soil type (soft or hard rock) and season (peak or low farming season). Prices varied from $60 to $175 for well complete construction.
- **The poor are late entrants into the well-owning class**: In both the Aba Gerima and Debre Yacob Catchments, most of the poorest-third of households surveyed had constructed their wells after 2010 – over 80% in Aba Gerima and 100% in Debre Yacob. From the data, it could not be determined if people who constructed wells before 2010 would have been categorized as poor at that time, meaning that the wells have helped to raise them out of the lowest category.
- **Around 40% of the family wells are shared with neighbouring families, mostly for drinking:** Well owners reported that 99 out of 246 (40%) operational wells used for drinking were shared with neighbours, nearly 80% for drinking, and 40% of these wells are shared with 3 or more families

4.2 Risks in water quality and quantity

Sub-research question 2: What are the existing risks (and practices to reduce or mitigate risks) related to use of unprotected-or semi-protected water sources at household level, and the unregulated or uncontrolled utilisation of the groundwater resource at the watershed level?

4.2.1 Water quality

- **Most family wells have solid/faecal waste within 5m of the well, while around 10% have a latrine close by or upstream:** Around 70-90% of family wells surveyed were observed to have solid/faecal waste within 5 metres of the well, while 10-25% had a latrine either within 30 metres of the well or upstream of the well.

- **More than three quarter of family wells do not have basic protection against contamination.** Figure 7 shows that soak ways and drainage are very uncommon, allowing spilled (contaminsated) water to easily flow back into the well.

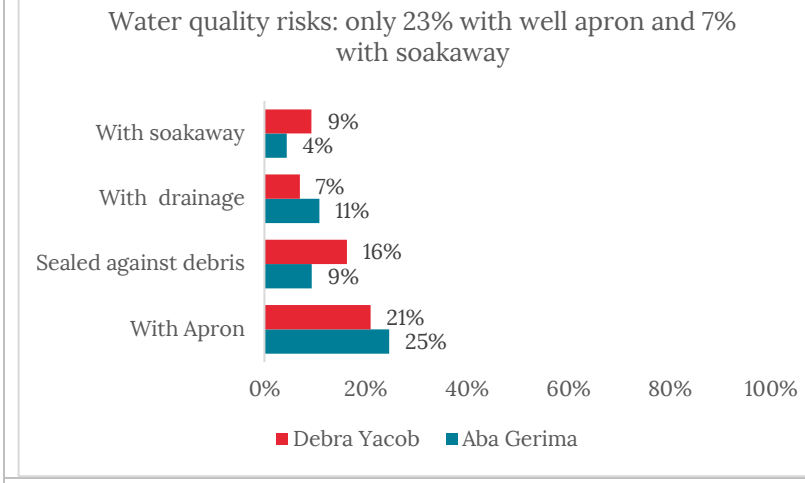

Figure 7 Source protection

- **Two thirds of wells do not have lining, parapets and seals and around 20% have stagnant water around the well during rains:** Between 50 and 70% of family wells surveyed in the two watersheds did not have lining, parapet and seal, and 17-31% were reported to have standing water within 5 metres of the well during the rainy season.

- Though only 13% of the wells have collapsed, a particular observation is that **six (16%) were used as latrine**, which in theory could lead to groundwater pollution even in dry periods.
- **Only 3% of the family wells are categorised as supplying "low - intermediate" risk** following WHO categorisation based on E-coli measurements (Figure 8).

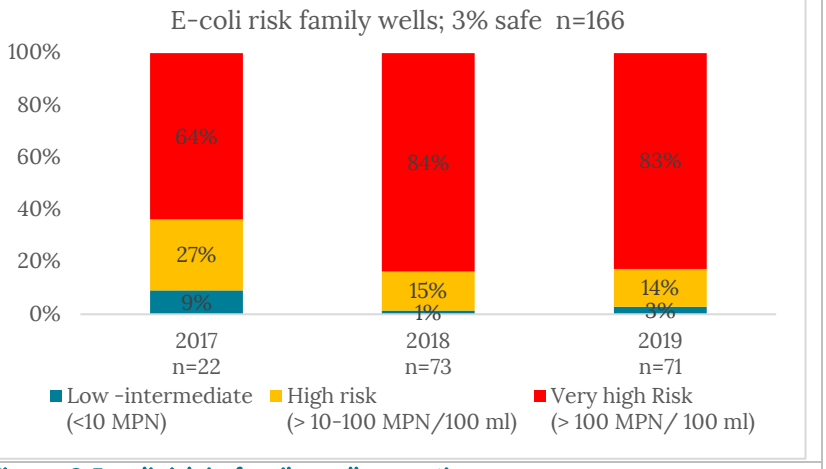

Figure 8 E-coli risk in family wells over time

- **More than 90% of the population face high or very high water quality risk** based on the E-coli measurements.

4.2.2 Water quantity

- **Around 12% of family wells do not provide year-round water, and around a third were reported to be inadequate for irrigation demand:** Owners said that 12% of the 592 operational family wells surveyed did not yield water through all 12 months in a year.

- A majority of well owners during the baseline felt that water levels **have *risen* due to watershed management work undertaken**, while a small but significant proportion of 10-15% of well-owners felt that water levels had fallen in their wells.
- **Seasonal fluctuation is considerable** from 4 m in the rainy season down to 11 m (Aba Gerima) and 9 m (Debre Yacob),. Values for 2017, 2018 and 2019 were comparable and no annual trend visible.

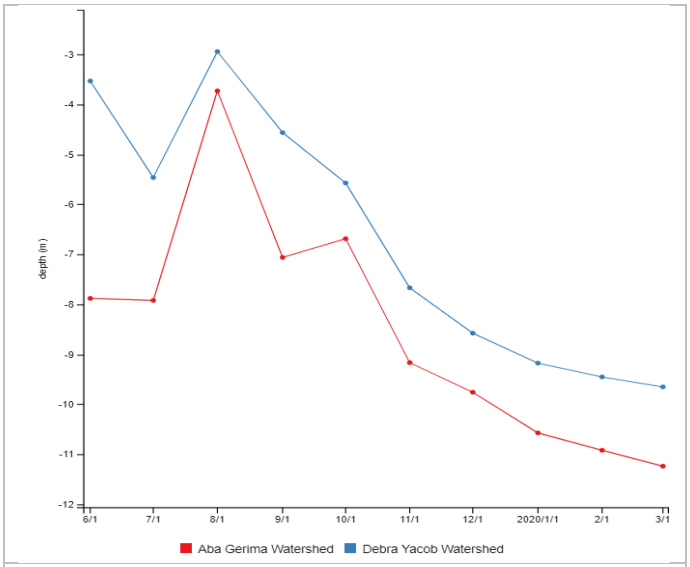

Figure 9 Average monthly water levels (by WLRC)

- **No correlation between water level and water quality was found**, nor a correlation of water quality with season.
- **Participative water level measurements were very viable**, but farmers were unsure how to use the information themselves. Multi-year comparisons would possibly change this, though could not be achieved within the project timeframe.
- **Threats to water quantity in family dug wells and community water sources are relatively small currently but could increase in future**. Currently there is hardly any motorized pumping of wells (though there is some pumping of surface water) and water lifting devices used on these family wells are low capacity. But increased demand for water in the future could see (competitive) water drilling and groundwater abstraction for irrigation – which could also affect wells used for drinking.

4.3 Well upgrade effectiveness

Sub-research Question 3: How effective are low-cost interventions (improved well head protection and lifting devices) in reducing risks associated with family wells?

- **No significant difference in risk**, following WHO categorisation, between any of the technologies has been observed. Figure 10 shows the 2019 monthly monitoring results which show just 5% supplied water with low to intermediate risk.

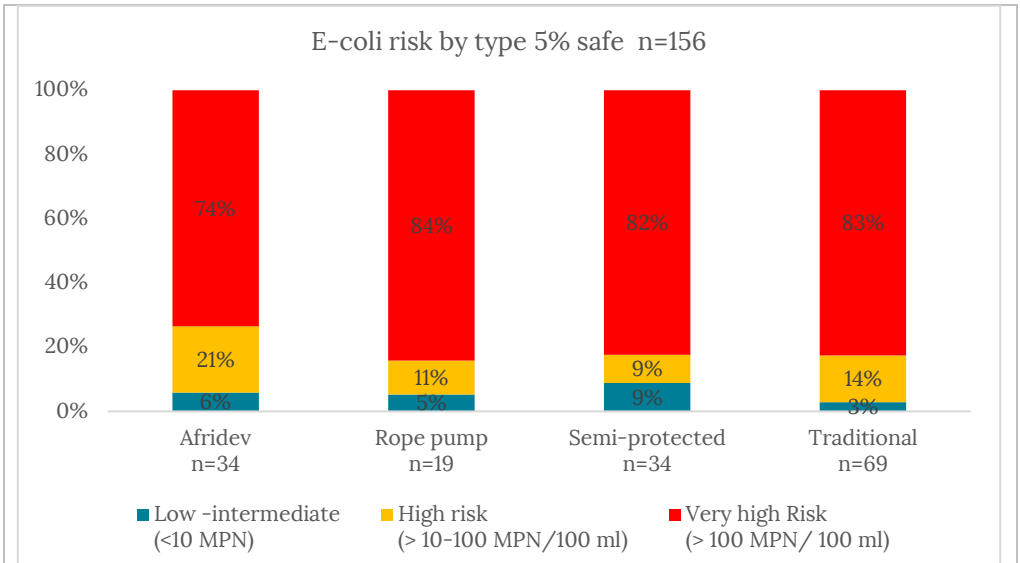

Figure 10 E-coli risk by technology type

- **Also improved wells with handpump (Afridev) or rope pump have high water quality risk**. This may be related to state of the pump (cracks in cement, loose bolts) but also due to sprout pollution. It was chosen to sample the water as available to users, thus no sterilisation of the sprout was done.
  In theory, also the chosen method Aquagenx Compartment Bag Test may not have been suitable (wrong ambient temperature), or the sampling by field team may have been incorrect, even though all precautions had been taken. However, these latter two reasons are unlikely.
- **Only 5 wells were upgraded to semi-improved, instead of the 80 that were hoped.** This low uptake was related that to the timing of the activities, mismatched expectations (previous projects provided goods for free), and insufficient awareness.
- **Low cost-upgraded improved perceived water quality** as users noted changes in color, the absence of turbid water and avoiding waste entering the mouth.
- **Introduction of pully systems were not showing risk reduction**, but did improve the burden of water lifting.
- **Production of rope pump is still limited and people were disappointed by the quality of the rope pumps**. The project has tried to address this by engaging with four rope pump manufacturers and sharing manuals and standards.
- **The collaboration between agriculture and water department is present at individual woreda level, but not at institutional level.** The colleagues involved in the project have been working and collaborating, leading for example to the offer by the water office South Mecha to making rope pumps available to those households that have upgraded their wells to semi-protected. However, the project has not lead to wider organisational approaches between the two departments.

5 Discussion and conclusions

5.1 On methodology

Overall, this research has been going different than planned and designed. First of all, there has been a **much longer timeframe** than was foreseen when the project was initiated in 2016. This was due to the difficult political situation in 2017-2018 and related insecurities and has provided difficulties in staffing and consistent follow-up. It is recognised that the project suffered considerable delays in submitting deliverables as well.

Secondly, the results of **the uptake** of semi-protected wells has been **disappointing** and has hampered the original sample size for the monitoring phase. Though the research itself is not about actually achieving self-supply, the limited outputs in terms of physical improvements seems discouraging for promotion of self-supply. The chosen approach of trainings and well demonstrations, the linkages with agriculture and water woreda colleagues were apparently not enough for the timeframe available. The farmers were able, willing and in general financially able to make improvements, yet they held them back and they choose not to improve. From the Focus group discussions, shows that the timing of the activities, mismatched expectations (previous projects provided goods for free), insufficient awareness raising were limiting.

The limited uptake of the well improvements has made the team reflect that some aspects, with hindsight, may have needed **a different approach**. Arguably, the demonstration sites should have been ready well before the dry season, to allow quicker uptake. Also, some aspects such as assumptions that improved wells are harder to clean, that everybody would get well upgrades for free and that previous projects left them de-motivated could have been captured earlier.

5.2 On overall research question

How do sustainable land management programmes relate to interventions promoting groundwater utilisation, and how can the benefits of groundwater development for the rural poor be secured and maximised?

The recognition and promotion of self-supply has always been a controversial topic in the WASH sector. Some believe that family wells and low-cost technologies are not worthy of professional attention and that their use is a risk than can only be addressed by providing alternative communal or piped supplies. Others argue that self-supply shows the efforts being made by thousands of Ethiopian families to develop their own family wells through their own hard work and investment (Sally Sutton, 2013) and that those efforts should be built on and improved rather than ignored. Even communal wells struggle to supply safe water and the need is rather to improve the performance of all forms of supply, not one of the other.

This research shows that within the sustainable land management programmes there **is willingness and ability** to make well investments, with many wells being constructed by families. The main driver for this is irrigation, but once present, many sources double up as domestic source as well. With the current household-irrigation strategy that promotes '1 family, 1 well' and targets 10% Ethiopian households (MoA/ATA, 2014), combined with the roaring Ethiopian economy, investments as we see in the research areas are expected to increase around the country.

Furthermore, initiatives around improving family wells as potential safe source may lead to **additional benefits** such as increase in community resilience against climate change as it widens

the portfolio of available water sources during times of stress (MacAllister, A.M., Kebede, Godfrey, & Calow, 2020).

The results throughout the study indicate that water quality is a difficult entity to define. It has been argued that a more graduated approach to monitoring than the "improved"/"unimproved" dichotomy is required (Bain, et al., 2014) and the proposed water technology ladder fits in that discussion. However, even going up the technology ladder, **securing water quality in the area has not been achieved**. The fact remains that water quality throughout the area and across the various technology options is poor.

Though the semi-protected traditional well may improve water quality (as reported for instance for turbidity), the microbial contamination from the bucket at rope itself will remain, unless a proper lifting device is applied. Yet even then, aside of the challenges in supplying safe drinking water, water handling and the deterioration of water quality at point of consumption, which is estimated to happen in 40% of the cases (Central Statistical Agency of Ethiopia, 2017), creates further health risks. In various discussions with the woreda colleagues, the possibility of **Household Filters to strengthen the self-supply approach** has been mentioned. This would fit with recommendations to develop one approach with other household-focused development interventions such as Community-led Total Sanitation and Household Water Treatment and Storage (Butterworth, Sutton, & Lemessa, 2013).

The reason for this lack of investment in and attention for water quality is probably partly because farmers are **not being told by agriculture department** that there is this opportunity or need. The agriculture department focus on irrigation and they do not have a mandate to say anything about drinking water. On the other hand, the domestic water sector has already its challenges on supplying community water supply and hardly focus on households.

Such a **shift in mindsets** and revision of planning mechanisms, as well as the day-to-day operational support requirements, represent a challenge for the under-resourced sectors. A consideration is to develop one approach with other household-focused development interventions such as Community-led Total Sanitation (CLTS) and Household Water Treatment and Storage (HWTS), to help in the scaling up of all (Butterworth, Sutton, & Lemessa, 2013).

This research therefore recommends **better alignment** between the agriculture and water sectors to achieve more productive and safer multiple use of the family wells. Also, the evidence suggests that well improvements are not happening easily even in (or because of) areas with intense existing land management programmes and if uptake within a relatively short time is pursued, **significant subsidy** or other forms of support will be needed.

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