A Pilot Study Investigating the Use of Hydrogen Peroxide for the Treatment of Pond Water Delivered by Water vendors in Dedaye Town, Ayeyarwaddy Division, Myanmar

July 2011

Acknowledgements

Back in June 2009, Save the Children gave a presentation at the WASH thematic working group of an assessment made of the water vendor market in the Ayeyarwaddy delta. Curt Bradner of ThirstAid and I were fascinated to learn of the extent of the market and immediately began investigating ways to encourage water vendors to become the agents of behaviour change regarding the water use and hygiene practices of urban and peri-urban residents who depend on these vendors for their domestic water supply. Since this time, we have been down many avenues, thinking of ways to both improve the livelihoods of water vendors as well as to improve the service they provide to communities in order to improve the health status of their customers.

Many of the roads taken were dead ends. We were convinced that hydrogen peroxide might provide the answer to our dilemma but the locally manufactured product we were testing proved too unstable to be marketable. However, during his extensive research for alternatives, Curt stumbled upon Sanosil and began establishing a relationship with Sanosil Global.

Although this pilot project was conducted by Oxfam GB, Curt and Cathy Bradner of ThirstAid have continued to be an inspiration as well as active supporters and a partner of this innovation, contributing two water carts and one water quality technician to the project along with many hours of moral support. I would like to deeply thank them for their inspiration, perseverance and tolerance. Without them, this pilot project would not have been possible.

I would also like to thank Chris Ungermann and David Lach of Sanosil Global for contributing all the Sanosil D10 used in this pilot project. When we first contacted them with the idea of using Sanosil in a development context, they were sceptical. However, thanks to their continuing support it was possible to take the findings of this pilot study to the next level and possibly develop an affordable and sustainable form of household water treatment for urban and peri-urban residents in Myanmar in the future.

Finally, I would like to thank the Oxfam GB, WASH team in Dedaye Township, Myanmar who implemented this pilot:

Myo Zaw	WASH Officer,	Oxfam GB, Myanmar
Za Ni Oo	Water Quality Technician	Oxfam GB, Myanmar
Aung Aung	Water Quality Technician	ThirstAid, Myanmar

The success of this pilot is primarily attributed to the diligence, attention to detail and superb facilitation skills of this team. They passionately believed in the potential of this idea and worked tirelessly to ensure all the appropriate data was accurately collected and triangulated.

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Executive Summary

A large proportion of urban and peri-urban residents in Dedaye Town, Ayeyarwaddy Division purchase their domestic water supply from water vendors. Water is collected from highly contaminated community ponds and transported to households on rickety wooden carts housing rusty, 50-gallon, recycled oil drums.

At the household level, drinking water is rarely treated beyond sedimentation in the domestic water storage container and straining through a muslin cloth and despite the Ministry of Health actively promoting improved hygiene practices through their '4 cleans' campaign for over 20 years, little impact has been observed regarding behaviour change relating to water use and hygiene practices. Under normal conditions, waterborne diarrhoeal illnesses are highly prevalent, particularly in children under 5-years-old, creating additional burdens on care givers and increasing financial burdens associated with medical care and absences from work. This presents a heightened risk in the event of flooding or epidemics.

The primary objective of this study was to determine whether pond water treated with Sanosil, a combination of hydrogen peroxide and silver, can effectively provide safe drinking water at the point of consumption without requiring behaviour change from consumers.

Five households participated in this study which was conducted during the peak dry season when the levels of contamination in the community ponds are at their highest. So as not to distort purchasing practices, vendors sold the treated water to the 5 households at the standard rate of 500 MMK ($0.63) for 50 gallons.

Records were kept of the water use and hygiene practices of participating households and water quality testing was conducted on a daily basis for both bacteriological contamination using E-coli as a proxy indicator of faecal contamination as well as for hydrogen peroxide. Testing was conducted on source water, water within the domestic water storage containers located outside the target houses and on drinking water in the household drinking water containers.

For the first two weeks of the study, treated water was delivered to the target households with a hydrogen peroxide concentration of 11 mg/l. While significant reductions were observed, high levels of contamination were observed on 3 days. These days corresponded to an unusual spell of rain when households were harvesting and drinking untreated rainwater instead of purchasing water from the vendors. Despite this, the residual hydrogen peroxide levels detected in both the domestic storage containers and the household drinking water containers were very low and it was still questionable whether the initial concentration of hydrogen peroxide was sufficient to withstand re-contamination by poor water use and hygiene practices. Consequently, in the third and forth weeks of the study, the concentration of hydrogen peroxide was increased to 17 mg/l.

At this concentration, higher residual concentrations were observed in the domestic water storage container than in the first two weeks of the study. However, concentrations within the drinking water container remained lower implying that target households contaminate their water during transfer and drinking water storage and that the hydrogen peroxide continued to be active both disinfecting the drinking water and the storage containers. Bacteriological contamination of 10 cfu/100ml or over was only observed on 3 occasions (6% of samples) during the second half of the study; once for each of 3 households while residual concentrations of over 2mg/l were only observed in 8% of samples.

The study concludes that Sanosil has a great potential for household water treatment using highly contaminated water sources. The unique combination of hydrogen peroxide and silver ensures a stable compound which is able to maintain residual concentrations of hydrogen peroxide for at least as long as it takes a household to empty a 50-gallon domestic storage container. Interviews with all 5 of the participating households revealed not only a strong

demand to keep using Sanosil but also a willingness to pay for the product. In addition, many residents of Dedaye not participating in the pilot study showed a great interest in the product by trying to entice the vendor to sell their household Sanosil.

Whilst this pilot study has proved that Sanosil treated water delivered by water vendors from highly contaminated sources can effectively produce 'safe' drinking water at the point of consumption without requiring additional behaviour changes from target beneficiaries, adjustments are required to the initial Sanosil concentrations before the product should be marketed to a wider audience. To ensure a greater likelihood of adequate residual concentrations of hydrogen peroxide able to withstand recontamination during storage and transfer to the household drinking water container as well as recontamination from dirty utensils by removing water, a higher concentration of Sanosil is required to treat the source water.

In mid-2011, Oxfam GB will scale-up in Dedaye encouraging all full-time water vendors in the Town to offer Sanosil treated water to their customers. The project will be funded under the Oxfam GB, 2011 Innovation Fund and if successful will develop a model for scale-up by the private sector in other urban and peri-urban areas of Myanmar.

1.0 Introduction

According to an extrapolation from a survey conducted by Save the Children in May 2009[1], approximately 65% of residents in the Ayeyarwaddy delta in urban and peri-urban areas purchase domestic water from vendors primarily from contaminated sources such as community ponds. This water is usually transported on wooden carts holding buckets or recycled 50-gallon oil drums which vendors hire from local entrepreneurs for approximately $1 per day.

At the household level, drinking water is rarely treated beyond being strained through a muslin cloth and despite the Ministry of Health actively promoting improved hygiene practices through their '4 cleans' campaign for over 20 years, little impact has been observed regarding behaviour change relating to water use and hygiene practices. Under normal conditions, waterborne diarrhoeal illnesses are highly prevalent, particularly in children under 5-years-old, creating additional burdens on care givers and increasing financial burdens associated with medical care and absences from work. This presents a heightened risk in the event of flooding or epidemics.

During the both the emergency relief and recovery phases of the response to the Nargis cyclone of May 2008, many WASH agencies placed significant focus on providing safe water at the point of consumption through the promotion of low-cost household water treatment technologies. The most popular option was locally produced colloidal silver ceramic water filters with over 200,000 households benefiting from distributions. However, despite the filters effectively producing 'safe' water from highly contaminated sources, the health benefits have been limited by the fact that households must regularly clean their collection containers. In a survey conducted by the French Red Cross (FRC) in Mawlamyinegyun Township in December 2009, 74% of sampled households with ceramic water filters were still drinking bacteriological contaminated water as a result of poor cleaning practices of drinking water containers.

WASH implementing agencies in the delta focused primarily on highly vulnerable rural communities and little attention has been paid to urban and peri-urban areas where the prevalence of waterborne illnesses remains high. Although a number of effective water treatment options are currently available in the private sector, the majority are unaffordable to consumers with limited disposable incomes.

Over the past 5 years, Population Services International (PSI) has attempted to market dilute chlorine at a highly subsidized price throughout Myanmar. However, despite widespread advertising which has raised awareness of the risks associated with drinking contaminated water, sales of dilute chlorine in the private sector remain at very low levels despite its availability and low price.

[1] MMRD Research Services: Study of Water Vending Market in Water Supply System of the Delta Area (May 2009)

Even in emergency situations there is a strong resistance to using chlorine as a disinfectant for drinking water in Myanmar. In a recent post distribution monitoring survey conducted by Oxfam GB on its emergency WASH response to cyclone Giri in Pauk Township, Magway Division (March 2011), only 10% of sampled households regarded the one month's supply of dilute chlorine provided in the basic hygiene kit as useful. Of those households that had attempted to treat their drinking water with chlorine, the vast majority found the taste unpalatable and the smell offensive. Although the concept of adding a disinfectant to drinking water appears acceptable, an alternative disinfectant without taste or smell is required.

One potential disinfectant identified by Oxfam GB and ThirstAid for household water treatment in Myanmar is hydrogen peroxide. Hydrogen peroxide is manufactured in Myanmar by Industry One, a government owned company. However, initial tests conducted by both Oxfam GB and ThirstAid revealed that although when fresh, the locally produced hydrogen peroxide was able to effectively kill bacteria in pond water, the inconsistency of the product made it unreliable. The hydrogen peroxide manufactured in Myanmar has a highly limited shelf life and is quick to breakdown in water, particularly if exposed to direct sunlight. Consequently, an alternative product was required.

Sanosil Global, an American based company, produces a range of disinfectants, known commercially as Sanosil, which are combinations of hydrogen peroxide and silver. Testing on one of these products, Sanosil S10 [5% H_2O_2], conducted by Oxfam GB under laboratory conditions in Dedaye in December 2010, revealed this unique product to be considerably superior to the locally produced hydrogen peroxide. Sanosil S10 was found to effectively kill all E-coli, a proxy indicator of faecal contamination, in pond water within a period of between 90 minutes to 2 hours at concentrations of 11mg/l H_2O_2. The combination of hydrogen peroxide and silver was also found to significantly increase the stability of the disinfectant implying that residual levels might feasibly be able to continue disinfecting water until consumption.

2.0 Objectives of the Study

The primary objective of this study was to determine whether pond water treated with hydrogen peroxide can effectively provide safe drinking water at the point of consumption without requiring behaviour change from consumers.

In addition to the primary objective, the study will also answer the following questions:

- What concentration of hydrogen peroxide is required to effectively treat contaminated pond water while leaving a residual level which will withstand recontamination by poor water use and hygiene practices to produce safe water at the point of consumption?
- Is hydrogen peroxide a socially acceptable disinfectant for consumers in Dedaye Town?
- Is there a willingness to pay for disinfection of domestic water in downtown Dedaye?

3.0 Methodology

3.1 Target Households

To avoid raising false expectations in the community, a pre-selection of target households was conducted together with the water vendor who would be providing the water for this study. As vendors unofficially divide the consumer based between themselves and do not tend to encroach on other vendors' territory, participating households were selected from the current consumers for this vendor.

Five households were identified using the following criteria:

1. The household had completely exhausted its supply of rainwater for drinking water purposes.
2. The household purchases pond water all its domestic water from vendors.
3. The household drinks pond water without household water treatment prior to consumption i.e. boiling or filtration using a sand filter or ceramic water filter. Straining the water through a muslin cloth or the use of alum was regarded as permissible.
4. The household uses a maximum of 2 domestic water storage containers.
5. The household was willing to participate in the study and the head of household willing to sign a consent form.

The Oxfam GB, WASH Officer conducting an introductory meeting with the 5 participating households

The 5 households identified by the water vendor were approached by Oxfam GB staff together with the water vendor and invited to participate in the project. All 5 households identified accepted the offer and signed consent forms.

3.2 Baseline Survey

To establish water use and hygiene behaviour habits of the 5 target households, a baseline survey was conducted on 7th January 2011. The main findings of the survey were as follows:

> The demographics of the target group are suitable for this study. Whilst the majority are adults (63%), there are also a sufficient number of people in groups at higher risk to waterborne illnesses i.e. the elderly (10%), children 5-18 years-old (20%) and infants under 5-years-old (7%).
>
> The water use and hygiene practices of the target households were found to be highly similar to those of previous knowledge attitudes and practices (KAP) surveys conducted by Oxfam GB in Dedaye Township. Whilst there appears to be a reasonable level of knowledge associated with the risks of drinking contaminated water, apart from all households having covers on their water containers, poor water handling practices prevail, increasing the likelihood of recontamination from contact by hands during transfer or from containers that are not regularly or properly cleaned.

Details of the baseline survey can be found in Annex 01 of the guidelines presented in Annex A (page 42)

3.3 Sanosil

Initial experiments conducted in the early stages of the 2010-11 dry season when community ponds were full of rainwater determined that 100ml of Sanosil S10 (5% H_2O_2; 22.7 mg/l) was an appropriate dosage to treat 50-gallons of pond water. However, for this pilot project,

Sanosil Global advised the use of an alternative product, Sanosil D10 (2.5% H_2O_2; 25ppm Ag) to err on the side of caution regarding safety issues.

As importation into Myanmar is problematic, it was necessary to hand-carry the Sanosil into the country. Consequently, it was only possible to bring in 18 litres of the product which was the primary restricting factor in determining the sample size for this study.

The study was conducted between mid-March and mid-April, the peak dry season, when the volumes in community ponds were low and subsequently turbidity and bacteriological contamination was high. With caution in mind, initial dosages of Sanosil D10 were set at 100ml (H_2O_2: 11.4 mg/l). However, after 16 days, halfway through the study, the dose was increased to 150ml (H_2O_2: 17.1 mg/l).

Sanosil D10 [2.5% H_2O_2 ; 25ppm Ag]

3.4 Water Delivery

As part of an AusAID funded WASH project in Dedaye Township, one component investigated strategies for improving the livelihood of water vendors working in Dedaye Town. As part of this project, vendors were given the opportunity to invest in a subsidised improved water cart renting it from Oxfam GB on a 'lease to own' basis. This component was implemented in partnership with ThirstAid, Myanmar who donated the first two improved water carts.

Top left: An improved water cart from Twante Township designed by ThirstAid

Bottom left: An improved water cart after the first modifications by vendors in Dedaye

Right: The final design of water cart modified by water vendors in Dedaye

Initially, vendors were presented with a 3-wheeled, improved water cart designed by ThirstAid for water vendors in Twante Township, Yangon Division. However, the vendors of Dedaye were not satisfied with this design and subsequently, were invited to modify the design to meet there needs. Vendors made a number of significant modifications and the final result is presented in the two photos below. During the study, an additional modification was made by replacing the PVC tap with a flexible rubber hose.

So as not to distort consumer habits, pond water treated with Sanosil was provided to the 5 target households at no extra cost for treatment. The treated water was sold at the standard market price of 500 MMK ($0.63) for 50 gallons. Vendors were encouraged not to push the product too strongly and encourage extra sales but to merely respond to the demands of the 5 consumers.

3.5 Water Quality Monitoring

Water quality monitoring for E-coli, a proxy indicator of faecal contamination and hydrogen peroxide to measure residual levels were conducted by Oxfam technicians at 3 points in the water chain on a daily basis (Monday to Friday); at source, at point of delivery (glazed ceramic jars located outside the house) and at point of consumption (drinking water container within the house).

Bacteriological testing was conducted using an Oxfam Del Agua kit incubating samples for 16.5 hours using laryl sulphate as the growing media. Residual hydrogen peroxide levels were determined using a WagTech 7100 photometer and Palintest reagents.

Water quality testing conducted at the Oxfam GB Office, Dedaye

3.6 Monitoring of Consumer Water Use Habits

Daily monitoring of water use habits were conducted by three sources: Water vendors, household consumers and Oxfam technicians using the monitoring sheets presented in annexes 02-07 in the guidelines; Annex A (pages 49-56).

3.7 Data processing and Analysis

Data was input onto an excel spreadsheet on a daily basis and information from the 3 sources, vendors, households and Oxfam technicians triangulated in order to better understand consumer purchasing habits and water use and hygiene behaviour.

Participating households were kept informed of water quality which was successfully used as a strategy to maintain consumer interest in the product.

4.0 Limitations and Constraints

As a result of the difficulty to import Sanosil into Myanmar, only 18 litres of Sanosil D10 (2.5% H_2O_2; 25ppm Ag) was available for this study. Based on the findings of the baseline survey it was estimated that the 18 litres would only be sufficient for 5 households. Although the small sample size limited the extent to which the study could draw concrete conclusions on the effectiveness of Sanosil to ensure 'safe' water at the point of consumption from pond water, it was sufficient to reveal trends and to contribute to supporting the decision whether to scale-up the project to reach a wider consumer base in the future.

Although one of the criteria for household selection was that the households would purchase all of its domestic water supply from the water vendors for the duration of the study, other water sources were used by at least 3 of the 5 participating households as the average deliveries were only between 7 and 11 litres per person per day. When questioned, these households claimed to bathe and do their laundry at community ponds and insisted that apart from the brief spell of rain in the second week of the study, all the household water for cooking and drinking was purchased by the vendors.

In addition to improving the quality of household drinking water, the study was interested to investigate whether additional health benefits could arise from washing food and vegetables as well as hands with Sanosil treated water. Unfortunately, it was not possible to determine this. However, it should be noted that no incidences of severe diarrhoea were reported by any of the participating households.

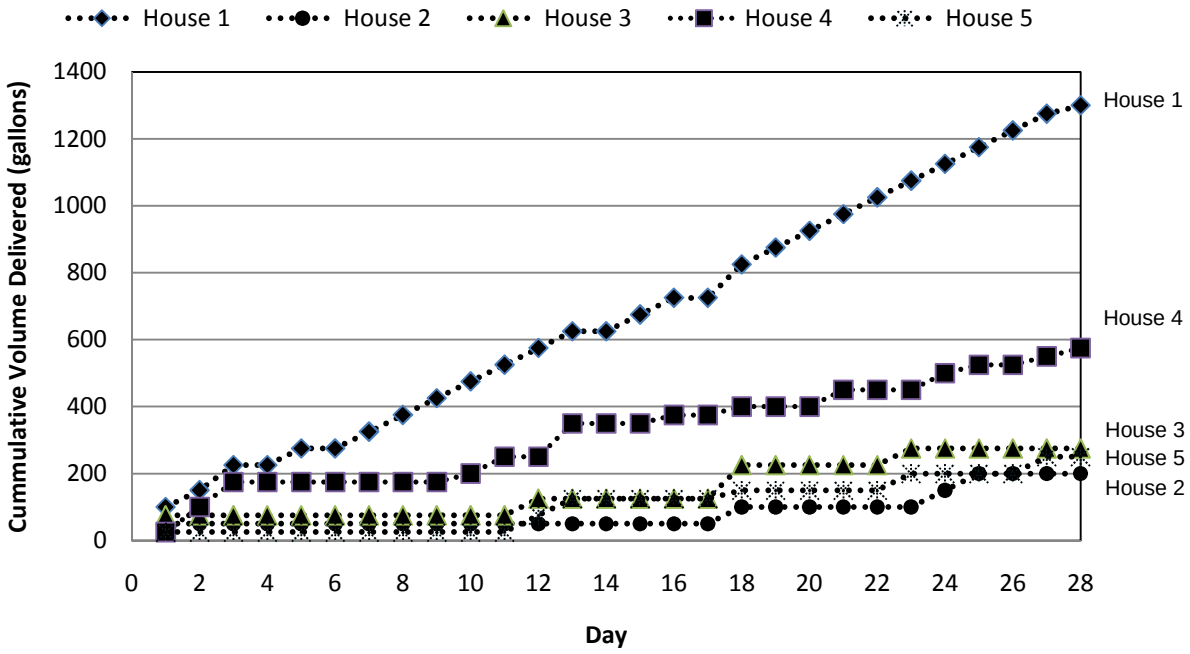
5.0 Results and Findings

5.1 Water Delivery

Only 2 of the 5 target households purchased water as regularly as was stated in the baseline survey: House 1 (22 purchases) and house 4 (13 purchases). The other three households only purchased water between 4 and 6 times during the 28-day study. The chart below presents the cumulative volume purchased while the table below presents a summary of the average deliveries to each house.

Water vendor delivering water from Dedaye's central community pond

Cummulative Volume of Water Delivered



	House 1	House 2	House 3	House 4	House 5
Number of deliveries (% days):	22 (79%)	5 (18%)	4 (14%)	13 (46%)	6 (21%)
Total volume delivered:	5,850 litres	1,125 litres	1,238 litres	1,590 litres	1,125 litres
Average volume per delivery:	265 litres	225 litres	310 litres	200 litres	190 litres
Average daily HH water use:	209 lit/HH/day	40 lit/HH/day	44 lit/HH/day	92 lit/HH/day	40 lit/HH/day
Average daily water use:	35 lit/p/day	7 lit/p/day	11 lit/p/day	10 lit/p/day	8 lit/p/day

House 1 is the only household that used water delivered by vendors for all their domestic uses, using an average of 35 litres per person per day. The other households used far less with an average of between 7 and 11 litres per person per day. However, even though the Sanosil treated water was not the only water used by the households, all 5 target households claimed the Sanosil treated water was the only drinking water consumed in the household during the 28-day study.

5.2 Water Use Habits of the 5 Target Households

All 5 target households own two, 50-gallon glazed ceramic water storage containers. These containers are typical of the majority of households in peri-urban Myanmar. All the storage containers had rubber covers and during this study, the covers were observed by both the vendors and the Oxfam technicians to be regularly used by all households.

Four of the five households use both containers at the same time, removing water indiscriminately. However, house 1 preferred using only one container as 50-gallons of water was sufficient for one day's domestic use. Only on occasions when the house stored more than 50 gallons at a time was the second container used. This household incidentally received the most deliveries with 22 deliveries over the 28 days of the project (79% of days).

A proud participant standing next to her domestic water storage container holding a bottle of Sanosil D10

Four of the five households use a traditional terracotta pot for the storage of drinking water while house 5 uses a plastic container fitted with a tap at the bottom. Water is transferred from the domestic storage container to the drinking water container using either a bucket or a bowl/scoop without a handle which increases the likelihood that water is contaminated from dirty hands during the transfer.

There appears to be a general awareness of the potential to contaminate drinking water in the household. However, none of the households use an effective method for household water treatment. The only improvements to water quality are made by filtering the pond water through a muslin cloth at the time of transfer to the drinking water container.

All 5 containers were fitted with covers which were observed to be regularly used during the study and 4 of the households remove water in ways that reduce the likelihood of contamination; 3 households use a scoop with a handle while house 5 has a tap fitted to the container. Only household 2 used a scoop without a handle which significantly increases the likelihood of recontamination.

According to both water vendors and Oxfam technicians, the water use and hygiene behaviour of these 5 target households are believed to be typical of the majority of residents in Dedaye town. All 5 target households practice some risky behaviour regarding the way water is used in the household which increases the likelihood of contaminating drinking water. A summary of the breakdown of these behaviours are presented on the following page.

Summary of Water Use Behaviour of 5 Target Households

GENERAL

	HOUSE 1	HOUSE 2	HOUSE 3	HOUSE 4	HOUSE 5
Head of Household	U Myint Win	U Zaw Tun	Daw Than Than Aye	Daw Khin Than	U Zaw Moe Latt
Size of household	6 members (6 adults)	6 members (2 adults, 2 children, 2 infants)	4 members (1 elderly, 2 adults, 1 child)	9 members (1 elderly, 7 adults, 1 child)	5 members (1 elderly, 2 adults, 2 children)

DELIVERIES

Number of deliveries:	22 days out of 28 (79%)	5 days out of 28 (18%)	4 days out of 28 (14%)	13 days out of 28 (46%)	6 days out of 28 (21%)
Total volume delivered:	5,850 litres (1300 gallons)	1,125 litres (250 gallons)	1,238 litres (275 gallons)	1,590 litres (575 gallons)	1,125 litres (250 gallons)
Average volume delivered:	265 litres (59 gallons)	225 litres (50 gallons)	310 litres (69 gallons)	200 litres (44 gallons)	190 litres (42 gallons)
Average daily HH water use:	209 litres / HH / day (46.4 gallons/HH/day)	40 litres / HH / day (8.9 gallons/HH/day)	44 litres / household / day (9.8 gallons/HH/day)	92 litres / household / day (20.5 gallons/HH/day)	40 litres / household / day (8.9 gallons/HH/day)
Average daily water use:	35 litres / person / day	7 litres / person / day	11 litres / person / day	10 litres / person / day	8 litres / person / day

STORAGE OF DOMESTIC WATER

Domestic Storage Container:	2 x 50-gallon, glazed ceramic water storage container	2 x 50-gallon, glazed ceramic water storage container	2 x 50-gallon, glazed ceramic water storage container	2 x 50-gallon, glazed ceramic water storage container	2 x 50-gallon, glazed ceramic water storage container
Storage habits:	Usually use only one of the two containers	Use both containers – no preference	Use both containers – no preference	Use both containers – no preference	Use both containers – no preference
Cover/uncovered:	Fully covered (100%)	Fully covered (100%)	Fully covered (100%)	Fully covered (100%)	Fully covered (100%)
Time when refilled:	Refilled when empty	No pattern – refilled indiscriminately	No pattern – refilled indiscriminately	No pattern – refilled indiscriminately	Tend to almost exhaust supply before buying more

DRINKING WATER CONTAINER

Type of container:	Ceramic – unfired clay	Ceramic – unfired clay	Ceramic – unfired clay	Ceramic – unfired clay	Plastic
Utensil for transferring water	Bucket	Bucket	Bowl / scoop (no handle)	Bucket	Bowl / scoop (no handle)
HH water treatment:	Strained through a cloth	Strained through a cloth	Strained through a cloth	Strained through a cloth	Strained through a cloth
Cover/uncovered:	Fully covered (100%)	Fully covered (100%)	Fully covered (100%)	Fully covered (100%)	Fully covered (100%)
Utensil for removing drinking water	Scoop with a handle	Cup or bowl (no handle)	Scoop with a handle	Scoop with a handle	Container fitted with a tap

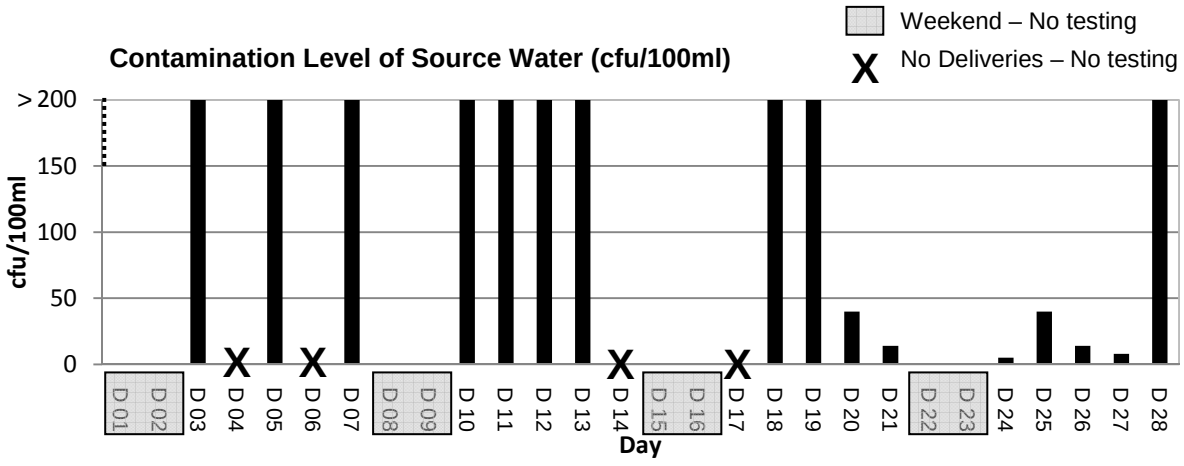
5.3 Water Quality

5.3.1 Source Water

Water vendors delivered water to the 5 participating households from a 100ft x 100ft community pond in the centre of Dedaye Town. The source water was tested on a daily basis for bacteriological contamination (Monday - Friday) with two samples being taken on 16 of the 28 days of the study and an average of the two samples recorded. No samples were taken on 4 of the weekly testing days as no deliveries were made on these days by vendors.

For the first 19 days of the 28-day study deliveries from the community pond were found to be highly contaminated (>200 cfu/100ml). However, between day 20 and day 27, levels of below 50 cfu/100ml were recorded. The chart below presents a daily record of the contamination level of the community pond during the study.

Water vendors collecting from Dedaye's central community pond



5.3.2 Household Level

Water was sampled on a daily basis (Monday - Friday) at two points at the household level; from the domestic storage container outside the house and from the drinking water container within the house. Testing was conducted for both bacteriological contamination and for residual hydrogen peroxide concentrations.

The following 15 pages present the results of this testing for each of the five houses separately. On the first page, a table of data is presented, while the second page presents the results in chart form. Note that the charts with black bars are for the household drinking water container while grey bars are used for the domestic storage container. The third page presents a summary of the water use and hygiene habits of the house and a narrative summary.

5.3.2.1 House Number 1: Water Quality

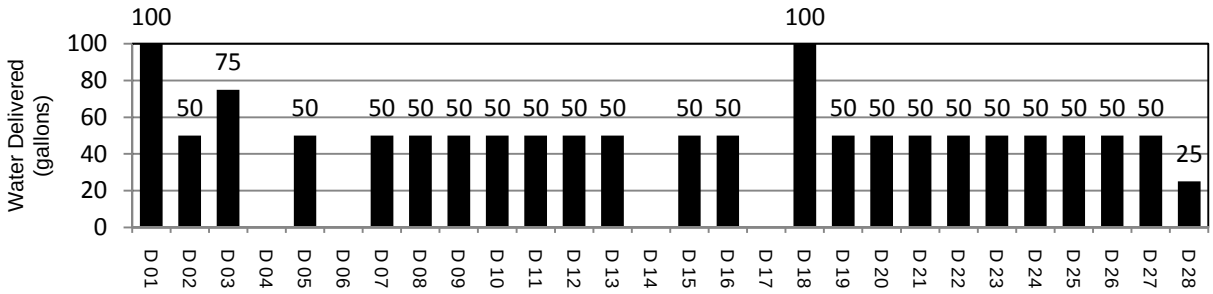
Day	Source Water		Domestic Storage Container				Drinking Water Container		
	E-Coli per 100ml	Volume Delivered (gallons)	Turbidity	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml
D 01		100							
D 02		50							
D 03	> 200	75	5	Fully Covered	1	0	Fully Covered	2	0
D 04			5	Fully Covered	4	0	Fully Covered	3	1
D 05	> 200	50	5	Fully Covered	4	60	Fully Covered	2	3
D 06			5	Fully Covered	3	2	Fully Covered	1	1
D 07	> 200	50	5	Fully Covered	2	0	Fully Covered	2	0
D 08		50							
D 09		50							
D 10	> 200	50	5	Fully Covered	13	0	Ceramic	1	50
D 11	> 200	50	5	Fully Covered	1	0	Fully Covered	1	0
D 12	> 200	50	5	Fully Covered	9	0	Fully Covered	1	80
D 13	> 200	50	5	Fully Covered	2	0	Fully Covered	2	0
D 14			5	Fully Covered	2	0	Fully Covered	2	0
D 15		50							
D 16		50							
D 17			5	Fully Covered	1	3	Fully Covered	1	0
D 18	> 200	100	5	Fully Covered	18	0	Fully Covered	1	1
D 19	> 200	50	5	Fully Covered	18	0	Fully Covered	1	0
D 20	40	50	5	Fully Covered	17	0	Fully Covered	7	0
D 21	14	50	5	Fully Covered	15	0	Fully Covered	2	0
D 22		50							
D 23		50							
D 24	5	50	5	Fully Covered	2	0	Fully Covered	1	0
D 25	40	50	5	Fully Covered	1	0	Fully Covered	1	0
D 26	14	50	5	Fully Covered	2	0	Fully Covered	1	0
D 27	8	50	5	Fully Covered	1	0	Fully Covered	1	0
D 28	> 200	25	5	Fully Covered	1	0	Fully Covered	1	0

No delivery made on this day

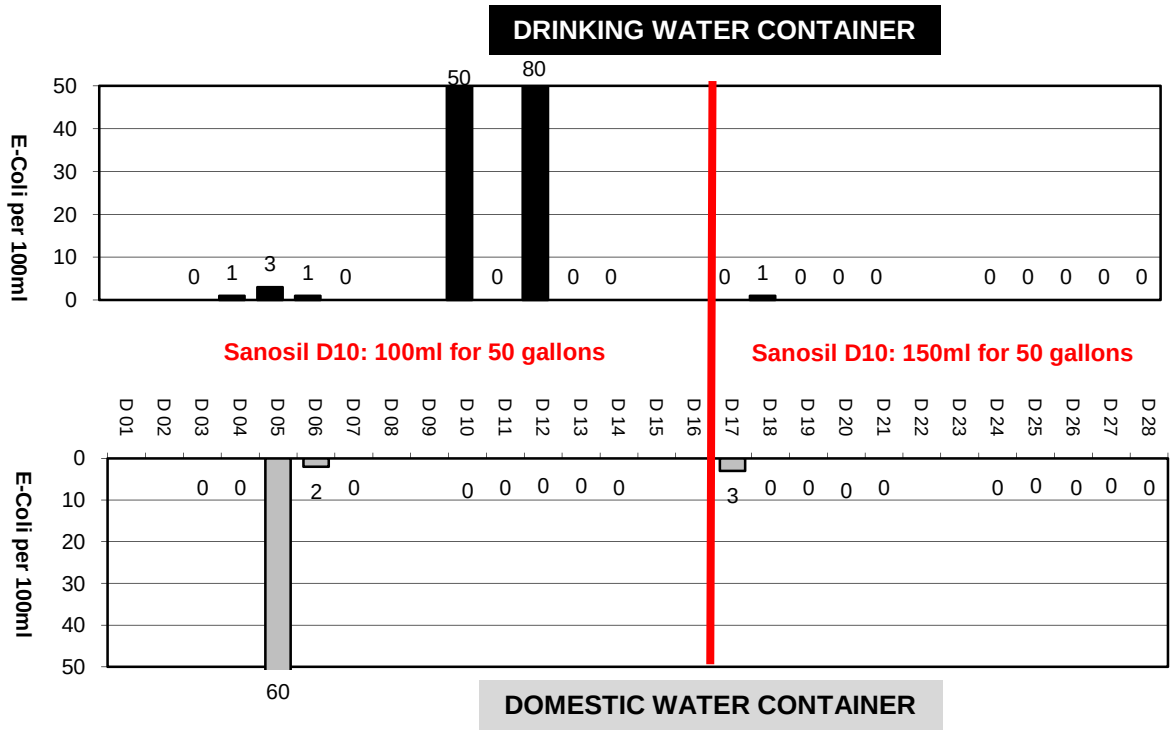
No water testing conducted (weekend)

House Number 1: Water Quality

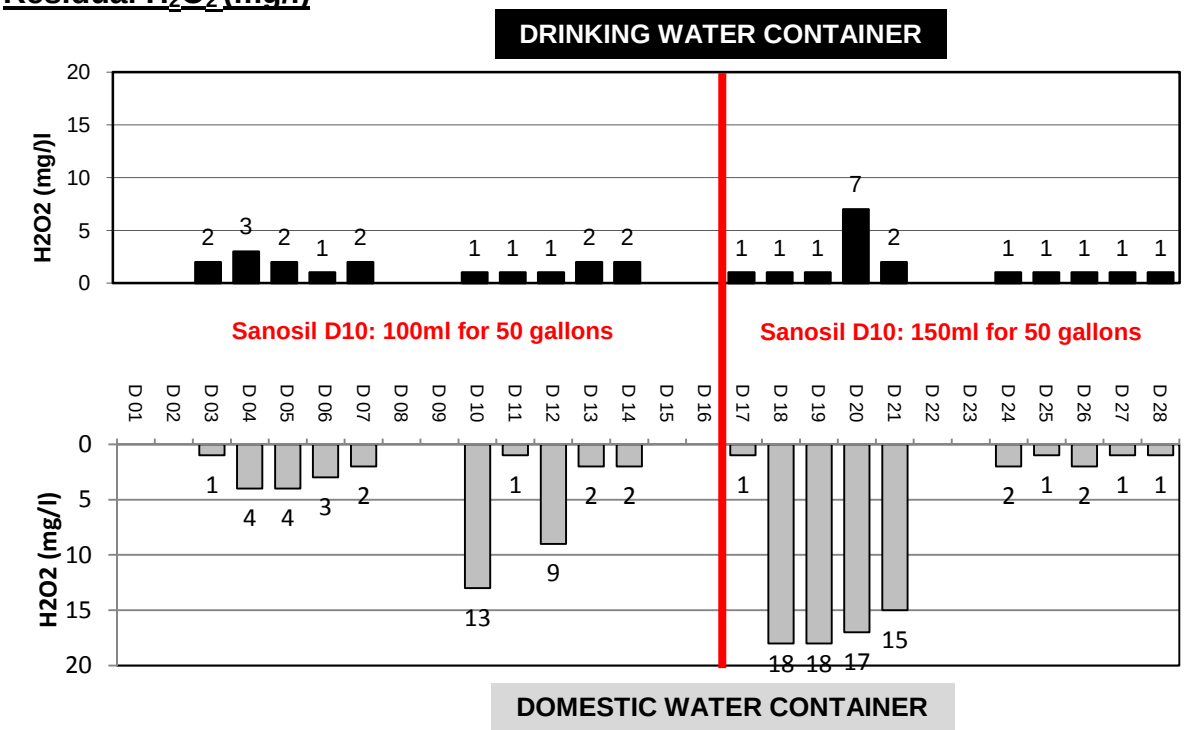
Delivery



E-Coli per 100ml



Residual H_2O_2 (mg/l)



House Number 1: General Water Use Behaviour

GENERAL

Head of Household	U Myint Win
Size of household	6 members (6 adults)

DELIVERIES

Number of deliveries:	22 days out of 28 (79%)
Total volume delivered:	5,850 litres (1300 gallons)
Average daily HH water use:	209 litres / HH / day (46.4 gallons/day)
Average daily water use:	35 litres / person / day

STORAGE OF DOMESTIC WATER

Domestic Storage Container:	2 x 50-gallon, glazed ceramic water storage container
Storage habits:	Usually use only one of the two containers
Cover/uncovered:	Fully covered (100%)
Time when refilled:	Refilled when empty

DRINKING WATER CONTAINER

Type of container:	Terracotta
Utensil for transferring water	Bucket
HH water treatment:	Strained through a cloth
Cover/uncovered:	Fully covered (100%)
Utensil for removing drinking water	Scoop with a handle

Summary of House 1

This house is fairly representative of the average household in Dedaye town. With 6 household members, it purchased an average of one 50-gallon unit per day at a price of 500 MMK ($0.63); an equivalent of 35 litres per person per day. Although the household has two 50-gallon storage containers, preference was given to one of the containers for all domestic purposes. The household has a basic awareness of contamination issues and keeps their domestic water storage containers fully covered.

Water is transferred to the household drinking water container using a bucket, strained through a muslin cloth and stored in a terracotta container to keep the water cool. Throughout the 28-day study, this container was observed to always be covered and drinking water extracted using a scoop with a handle demonstrating an awareness of potential contamination.

Significant bacteriological contamination of water in the domestic storage container was only detected on one occasion during the study (day 5). However at this time the drinking water container was not contaminated as drinking water was transferred shortly after delivery indicating that the concentration of hydrogen peroxide in the drinking water was sufficient to withstand this level of contamination when in the smaller drinking water container.

During the first 2 weeks of the study, drinking water was only found to be contaminated on two occasions; days 10 & 12. This period corresponded with unseasonal rains. During this period, the household reported using untreated rainwater as their drinking water source and this most likely explains the contamination.

In the second half of the study when the dosage of Sanosil D10 was increased to 150ml for 50 gallons (17mg/l) and the source water reduced to below 50 cfu/100ml, no contamination was detected in the drinking water. Increased residual levels of H_2O_2 were detected in the domestic storage container during the third week of the study. However, H_2O_2 levels in the drinking water container remained very low (1 mg/l) throughout the study indicating that the hydrogen peroxide was required to treat secondary contamination in the drinking water container.

5.3.2.2 House Number 2: Water Quality

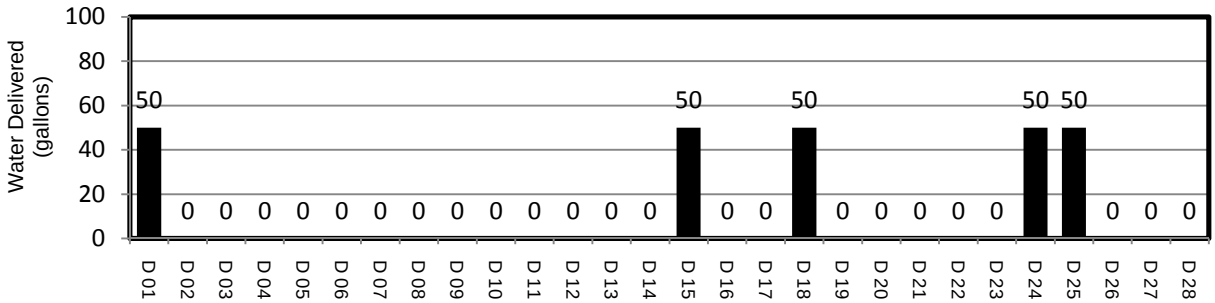
Day	Source Water		Domestic Storage Container				Drinking Water Container		
	E-Coli per 100ml	Volume Delivered (gallons)	Turbidity	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml
D 01		50							
D 02									
D 03	> 200		5	Fully Covered	4	0	Fully Covered	3	0
D 04			5	Fully Covered	7	0	Fully Covered	6	0
D 05	> 200		5	Fully Covered	2	10	Fully Covered	3	2
D 06			5	Fully Covered	1	10	Fully Covered	1	1
D 07	> 200		5	Fully Covered	1	9	Fully Covered	1	0
D 08									
D 09									
D 10	> 200		5	Fully Covered	1	1	Fully Covered	1	100
D 11	> 200		5	Fully Covered	1	20	Fully Covered	1	9
D 12	> 200		5	Fully Covered	1	40	Fully Covered	1	100
D 13	> 200		5	Fully Covered	1	50	Fully Covered	1	1
D 14			5	Fully Covered	2	100	Fully Covered	1	4
D 15									
D 16									
D 17			5	Fully Covered	7	2	Fully Covered	1	0
D 18	> 200	50	5	Fully Covered	10	0	Fully Covered	1	0
D 19	> 200		5	Fully Covered	7	0	Fully Covered	1	0
D 20	40		5	Fully Covered	4	0	Fully Covered	1	0
D 21	14		5	Fully Covered	1	0	Fully Covered	4	0
D 22									
D 23									
D 24	5	50	5	Fully Covered	1	0	Fully Covered	1	0
D 25	40	50	5	Fully Covered	6	0	Fully Covered	1	6
D 26	14		5	Fully Covered	3	0	Fully Covered	1	0
D 27	8		5	Fully Covered	2	0	Fully Covered	10	0
D 28	> 200		5	Fully Covered	2	0	Fully Covered	2	0

No delivery made on this day

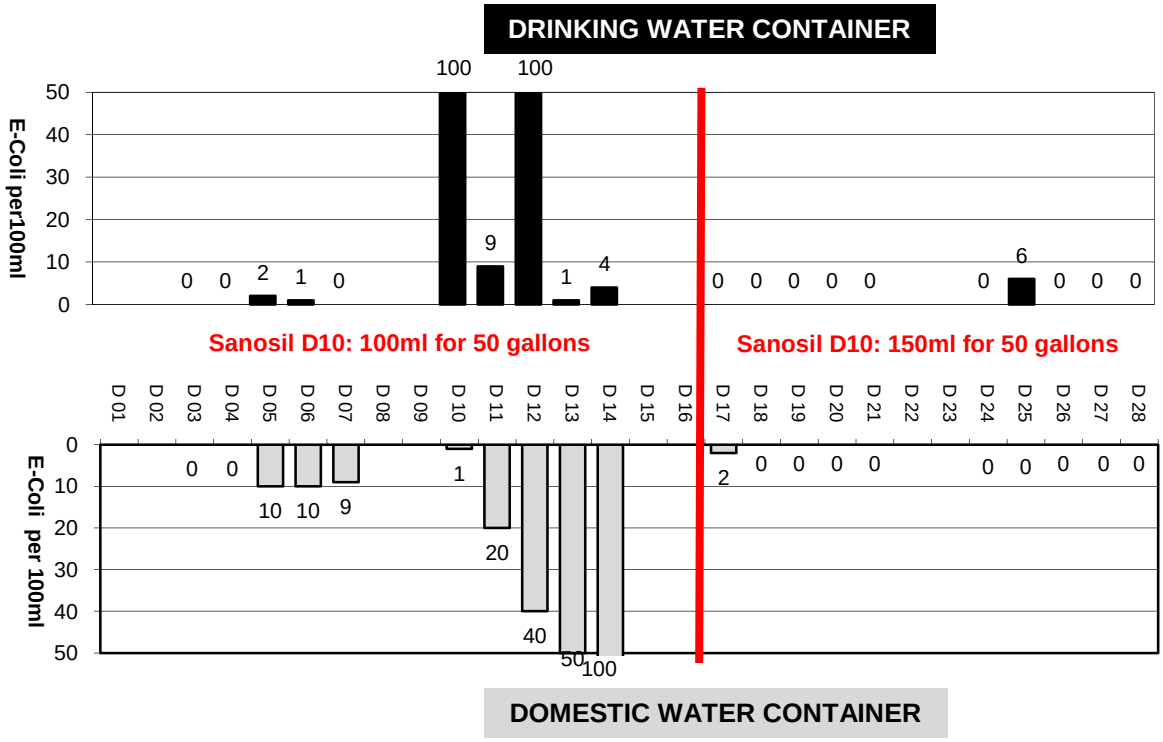
No water testing conducted (weekend)

House Number 2: Water Quality

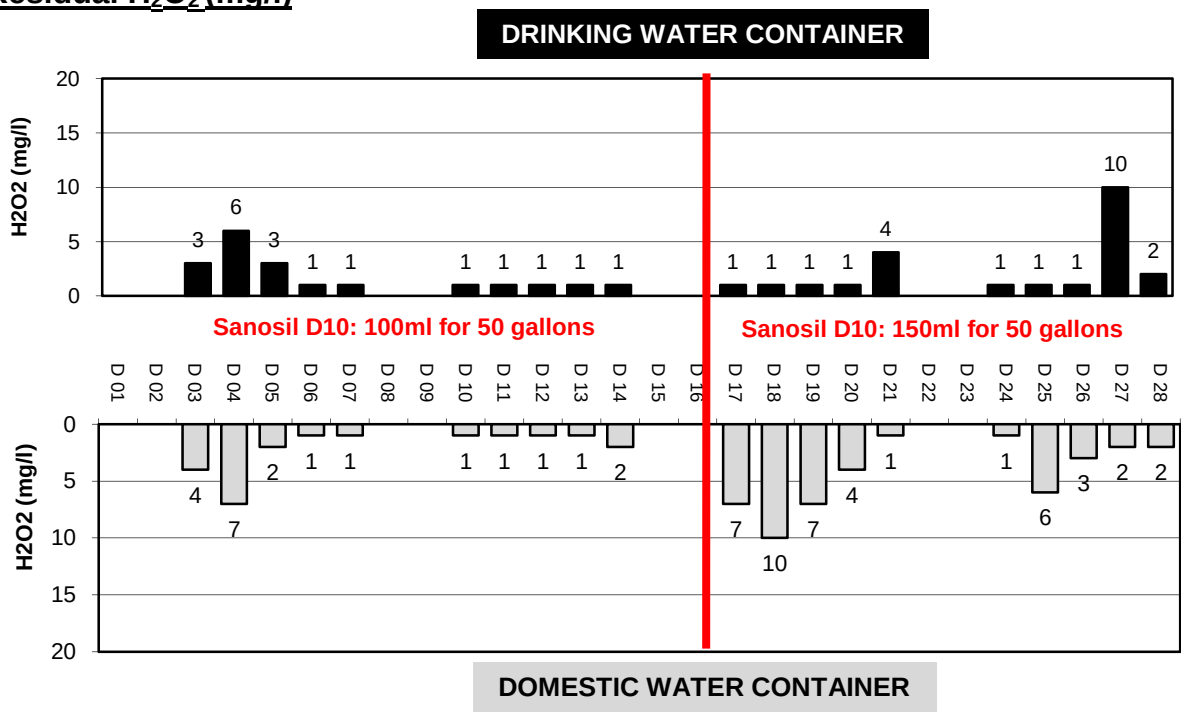
Delivery



E-Coli per 100ml



Residual H_2O_2 (mg/l)



House Number 2: General Water Use Behaviour

GENERAL

Head of Household	U Zaw Tun
Size of household	6 members (2 adults, 2 children, 2 infants)

DELIVERIES

Number of deliveries:	5 days out of 28 (18%)
Total volume delivered:	1,125 litres (250 gallons)
Average volume delivered:	225 litres (50 gallons)
Average daily HH water use:	40 litres / HH / day (8.9 gallons/day)
Average daily water use:	7 litres / person / day

STORAGE OF DOMESTIC WATER

Domestic Storage Container:	2 x 50-gallon, glazed ceramic water storage container
Storage habits:	Use both containers – no preference
Cover/uncovered:	Fully covered (100%)
Time when refilled:	No pattern – refilled indiscriminately

DRINKING WATER CONTAINER

Type of container:	Terracotta
Utensil for transferring water:	Bucket
HH water treatment:	Strained through a cloth
Cover/uncovered:	Fully covered (100%)
Utensil for removing drinking water:	Cup or bowl (no handle)

Summary for House 2

House number 2 only purchased water from the vendor on 5 occasions; a total of 250 gallons. As with house number 1, they collected rainwater between days 7 and 10 and used this as their primary drinking water source until it was exhausted. The household stored their domestic water in two 50-gallon glazed ceramic jars which they keep covered, indicating a basic awareness of contamination issues.

Water was transferred to the household drinking water container using a bucket, strained through a muslin cloth and stored in a terracotta container to keep the water cool. Throughout the 28-day study, this container was always observed to be covered. Drinking water was extracted from the terracotta container using a cup or bowl increasing the risk of contamination of the drinking water from dirty hands.

The household drinking water was only found to be highly contaminated on two occasions; days 10 & 12. This period corresponded with unseasonal rains. During this period, the household reported using untreated rainwater as their drinking water source and this most likely explains the contamination.

In the second half of the study when the dosage of Sanosil D10 was increased to 150ml for 50 gallons, minor contamination (6 cfu/100ml) was detected on one occasion. Increased residual levels of H_2O_2 were detected in the domestic storage container during this period. However, levels in the drinking water container remained very low throughout the study.

5.3.2.3 House Number 3: Water Quality

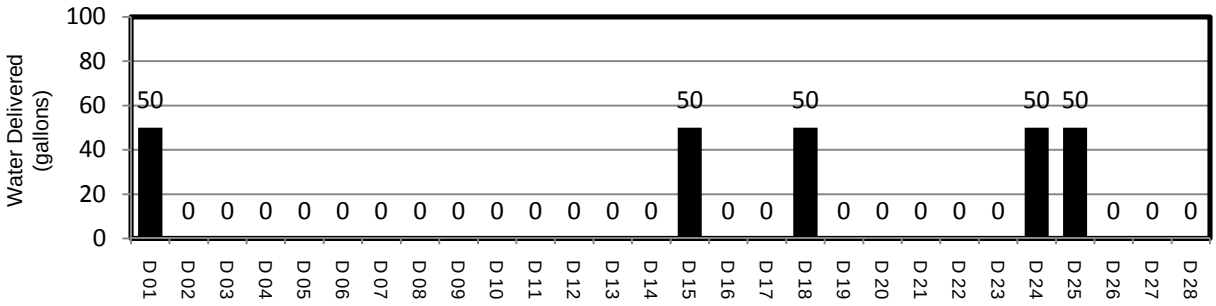
Day	Source Water		Domestic Storage Container				Drinking Water Container		
	E-Coli per 100ml	Volume Delivered (gallons)	Turbidity	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml
D 01		75							
D 02									
D 03	> 200		5	Fully Covered	1	1	Fully Covered	1	2
D 04			5	Fully Covered	2	0	Fully Covered	2	1
D 05	> 200		5	Fully Covered	2	0	Fully Covered	1	0
D 06			5	Fully Covered	2	0	Fully Covered	1	7
D 07	> 200		5	Fully Covered	1	0	Fully Covered	1	11
D 08									
D 09									
D 10	> 200		5	Fully Covered	1	0	Fully Covered	1	1
D 11	> 200		5	Fully Covered	1	0	Fully Covered	1	0
D 12	> 200	50	5	Fully Covered	14	0	Fully Covered	10	0
D 13	> 200		5	Fully Covered	7	0	Fully Covered	2	5
D 14			5	Fully Covered	5	0	Fully Covered	2	9
D 15									
D 16									
D 17			5	Fully Covered	1	0	Fully Covered	1	3
D 18	> 200	100	5	Fully Covered	22	0	Fully Covered	1	2
D 19	> 200		5	Fully Covered	13	0	Fully Covered	10	0
D 20	40		5	Fully Covered	5	0	Fully Covered	2	0
D 21	14		5	Fully Covered	2	0	Fully Covered	1	0
D 22									
D 23		50							
D 24	5		5	Fully Covered	7	0	Fully Covered	2	0
D 25	40		5	Fully Covered	4	0	Fully Covered	2	1
D 26	14		5	Fully Covered	1	0	Fully Covered	1	0
D 27	8		5	Fully Covered	1	0	Fully Covered	1	0
D 28	> 200		5	Fully Covered	1	0	Fully Covered	1	0

No delivery made on this day

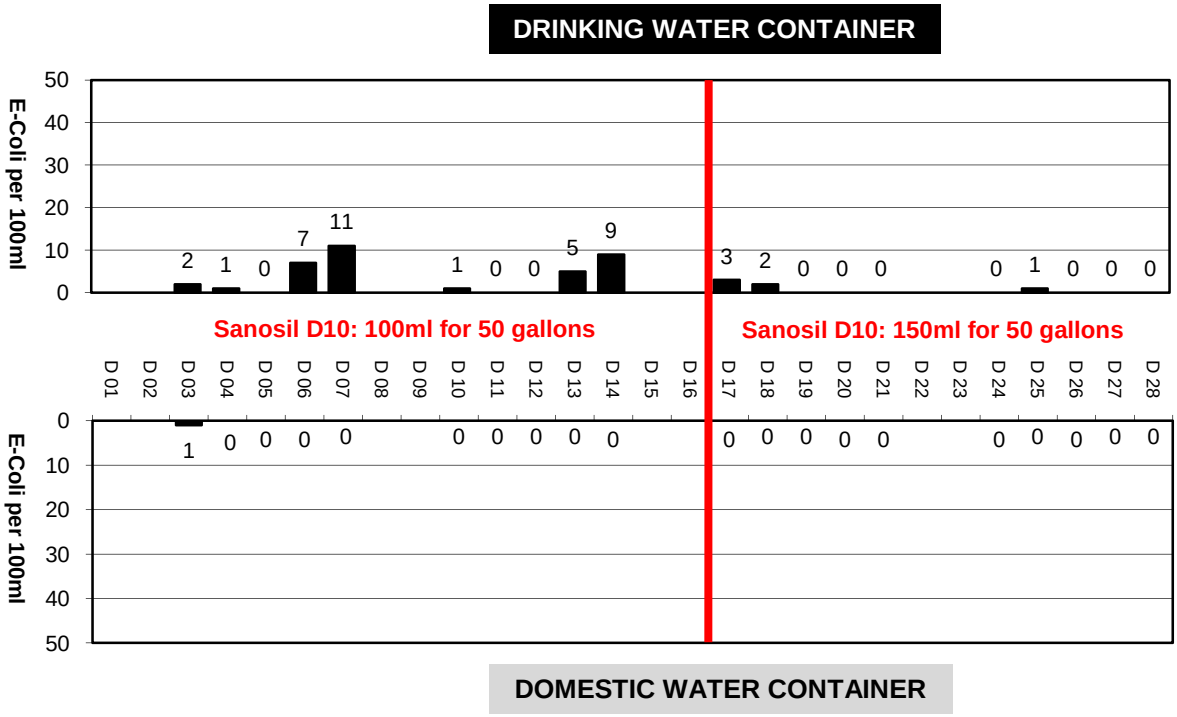
No water testing conducted (weekend)

House Number 3: Water Quality

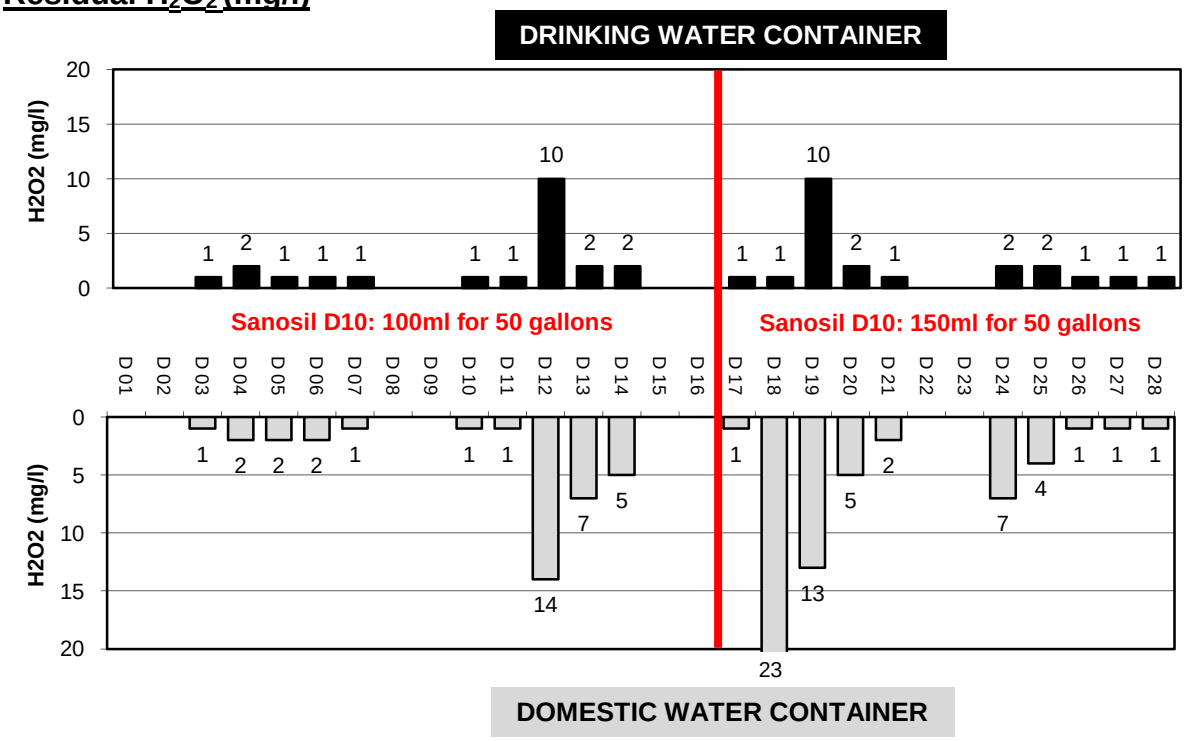
Delivery



E-Coli per 100ml



Residual H_2O_2 (mg/l)



House Number 3: General Water Use Behaviour

GENERAL

Head of Household:	Daw Than Than Aye
Size of household:	4 members (1 elderly, 2 adults, 1 child)

DELIVERIES

Number of deliveries:	4 days out of 28 (14%)
Total volume delivered:	1,238 litres (275 gallons)
Average volume delivered:	310 litres (69 gallons)
Average daily HH water use:	44 litres / household / day (9.8 gallons/day)
Average daily water use:	11 litres / person / day

STORAGE OF DOMESTIC WATER

Domestic Storage Container:	2 x 50-gallon, glazed ceramic water storage container
Storage habits:	Use both containers – no preference
Cover/uncovered:	Fully covered (100%)
Time when refilled:	No pattern – refilled indiscriminately

DRINKING WATER CONTAINER

Type of container:	Terracotta
Utensil for transferring water:	Bowl / scoop (no handle)
HH water treatment:	Strained through a cloth
Cover/uncovered:	Fully covered (100%)
Utensil for removing drinking water:	Scoop with a handle

Summary House 3

House number 3 only purchased water from the vendor on 5 occasions; a total of 275 gallons. As with the other households in this study, rainwater was collected between days 7 and 10 and used as the primary drinking water source until it was exhausted. The household stored their domestic water in two 50-gallon glazed ceramic jars which they keep covered, indicating a basic awareness of contamination issues.

Water was transferred to the household drinking water container using a bowl or scoop, strained through a muslin cloth and stored in a terracotta container to keep the water cool. Throughout the 28-day study, this container was always observed to be covered. Drinking water was extracted from the terracotta drinking water container using a scoop with a handle, demonstrating an awareness of the risks associated with contamination from dirty hands.

No significant bacteriological contamination was detected during this study. Levels of between 5 and 11 cfu/100ml were recorded on 4 occasions all of which were recorded during the first half of the study when lower concentrations of Sanosil D10 was used. In the second half of the study, when 150ml of Sanosil D10 was used to treat 50 gallons of pond water, almost no contamination was detected.

Increased residual levels of H_2O_2 were recorded in the second half of the study when both the dosage of Sanosil was increased and the contamination of the source water reduced. However, the concentration of H_2O_2 in the drinking water container was found to be low throughout the 28-day study; concentrations greater than 2 mg/l were only recorded on one occasion.

5.3.2.4 House Number 4: Water Quality

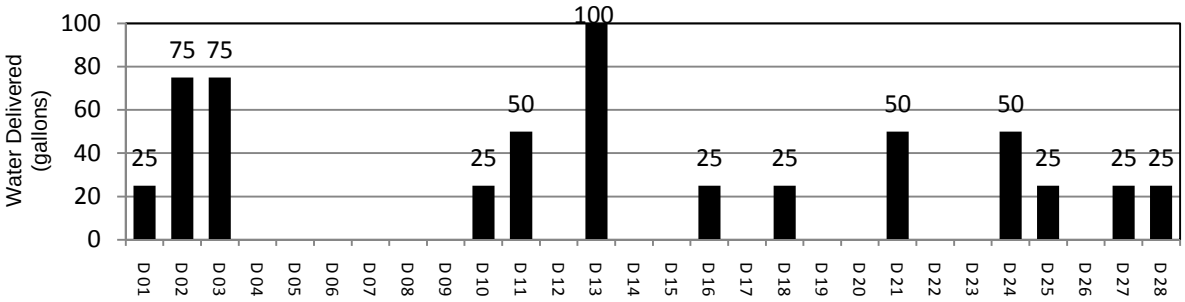
Day	Source Water		Domestic Storage Container				Drinking Water Container		
	E-Coli per 100ml	Volume Delivered (gallons)	Turbidity	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml
D 01		25							
D 02		75							
D 03	> 200	75	5	Fully Covered	1	2	Fully Covered	2	2
D 04		-	5	Fully Covered	8	0	Fully Covered	3	50
D 05	> 200	-	5	Fully Covered	2	0	Fully Covered	1	20
D 06		-	5	Fully Covered	1	0	Fully Covered	1	0
D 07	> 200	-	5	Fully Covered	1	2	Fully Covered	1	2
D 08		-							
D 09		-							
D 10	> 200	25	5	Fully Covered	8	0	Fully covered	8	0
D 11	> 200	50	5	Fully Covered	6	2	Fully Covered	5	0
D 12	> 200	-	5	Fully Covered	9	0	Fully Covered	6	0
D 13	> 200	100	5	Fully Covered	1	10	Fully Covered	1	20
D 14		-	5	Fully Covered	3	3	Fully Covered	1	1
D 15		-							
D 16		25							
D 17		-	5	Fully Covered	2	0	Fully Covered	1	0
D 18	> 200	25	5	Fully Covered	10	2	Fully Covered	1	20
D 19	> 200	-	5	Fully Covered	4	0	Fully Covered	2	0
D 20	40	-	5	Fully Covered	3	0	Fully Covered	2	0
D 21	14	50	5	Fully Covered	8	0	Fully Covered	1	0
D 22		-							
D 23		-							
D 24	5	50	5	Fully Covered	1	1	Fully Covered	1	0
D 25	40	25	5	Fully Covered	5	0	Fully Covered	1	0
D 26	14	-	5	Fully Covered	1	0	Fully Covered	1	0
D 27	8	25	5	Fully Covered	8	0	Fully Covered	1	0
D 28	> 200	25	5	Fully Covered	6	0	Fully Covered	2	0

No delivery made on this day

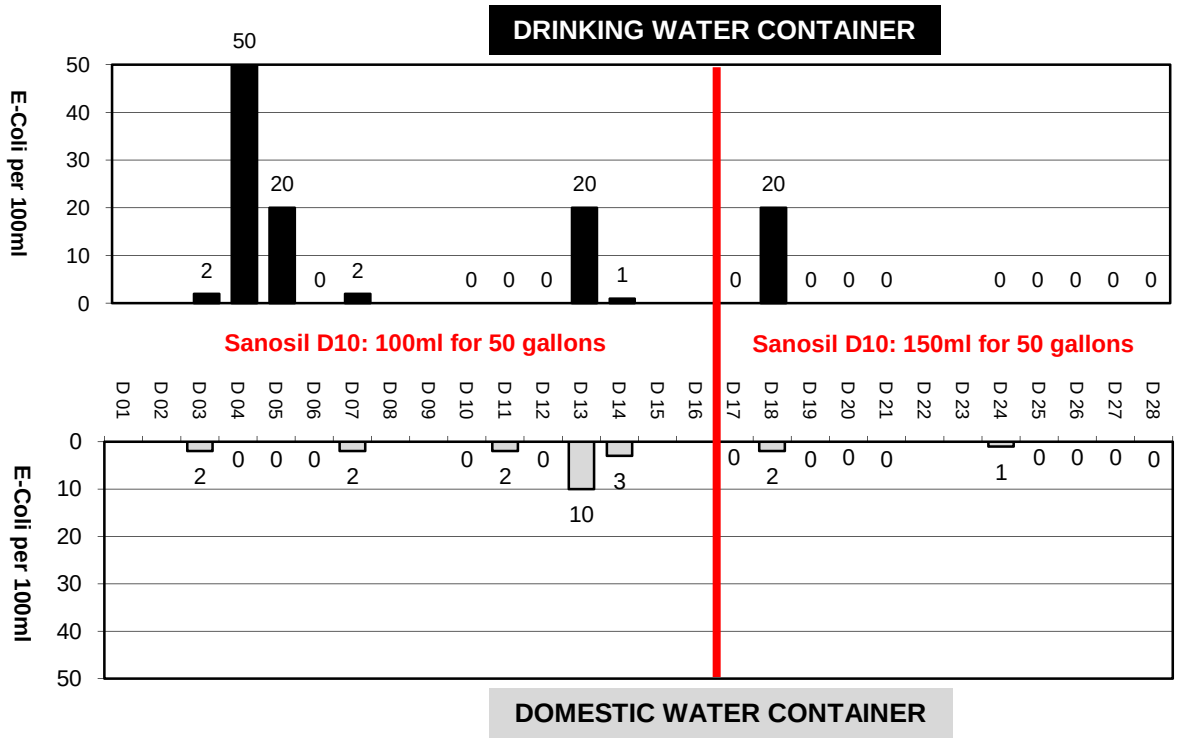
No water testing conducted (weekend)

House Number 4: Water Quality

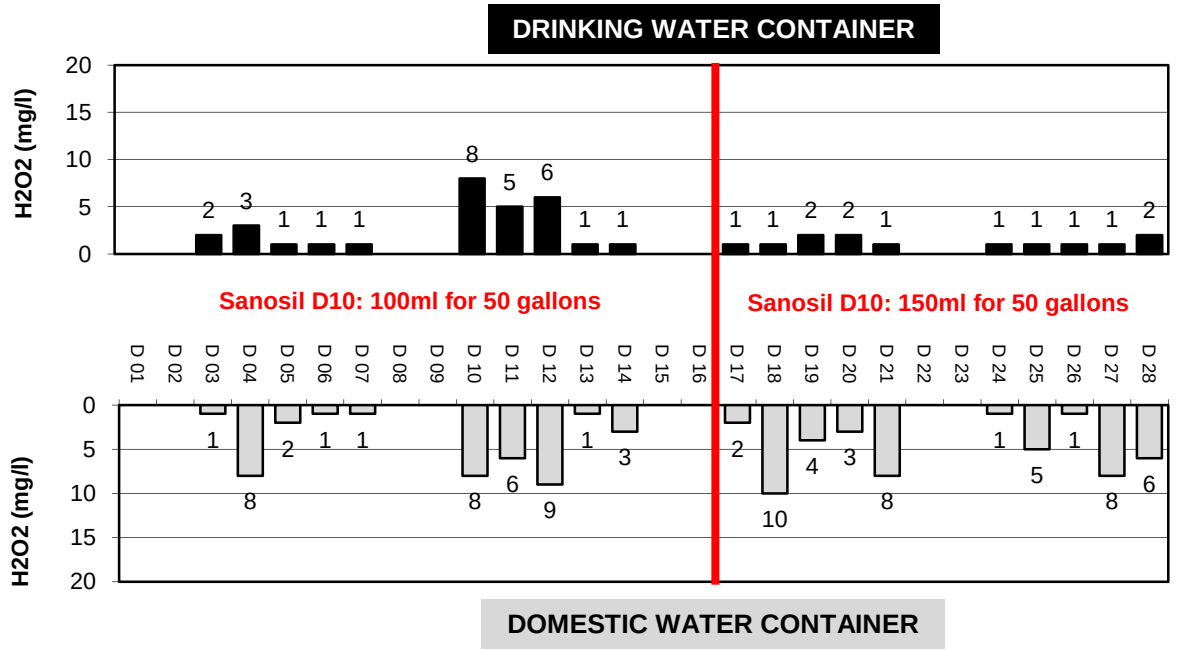
Delivery



E-Coli per 100ml



Residual H_2O_2 (mg/l)



House Number 4: General Water Use Behaviour

GENERAL

Head of Household:	Daw Khin Than
Size of household:	9 members (1 elderly, 7 adults, 1 child)

DELIVERIES

Number of deliveries:	13 days out of 28 (46%)
Total volume delivered:	1,590 litres (575 gallons)
Average volume delivered:	200 litres (44 gallons)
Average daily HH water use:	92 litres / household / day (20.5 gallons/day)
Average daily water use:	10 litres / person / day

STORAGE OF DOMESTIC WATER

Domestic Storage Container:	2 x 50-gallon, glazed ceramic water storage container
Storage habits:	Use both containers – no preference
Cover/uncovered:	Fully covered (100%)
Time when refilled:	No pattern – refilled indiscriminately

DRINKING WATER CONTAINER

Type of container:	Terracotta
Utensil for transferring water to container:	Bucket
HH water treatment:	Strained through a cloth
Cover/uncovered:	Fully covered (100%)
Utensil for removing drinking water:	Scoop with a handle

Summary of House 4

House number 4 purchased water on 13 occasions; a total of 575 gallons. Deliveries varied between 25 gallons and 100 gallons indicating that the pond water was the primary source for both cooking and drinking water in the household. As with the other households in this study, rainwater was collected between days 7 and 10 and used as the primary drinking water source until it was exhausted. The household stored their domestic water in two 50-gallon glazed ceramic jars which they keep covered indicating a basic awareness of contamination issues.

Water was transferred to the household drinking water container using a bucket, strained through a muslin cloth and stored in a terracotta container to keep the water cool. Throughout the 28-day study, this container was always observed to be covered. Drinking water was extracted from the terracotta drinking water container using a scoop with a handle demonstrating an awareness of the risks associated with contamination from dirty hands.

Significant bacteriological contamination i.e. >20 cfu/100ml, were detected on four occasions during this study; a concentration of 20 cfu/100ml was detected in 3 samples and 50 cfu/100ml on one occasion. Three of the contaminated samples were recorded in first half of the study when a lower concentration of Sanosil D10 was used to treat pond water. However in the second half, drinking water was found to be bacteria free on 9 out of 10 occasions (90%).

Reasonably high levels of residual H_2O_2 were recorded throughout the study in the domestic storage container (5-10 mg/l). However, levels of H_2O_2 in the drinking water container were considerably lower, particularly in the second half of the study indicating the possibility of significant recontamination from poor hygiene behaviour.

5.3.2.5 House Number 5: Water Quality

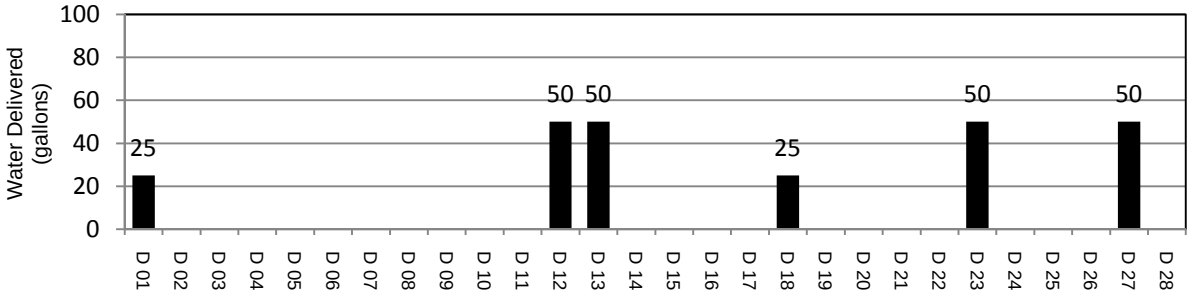
Day	Source Water		Domestic Storage Container				Drinking Water Container		
	E-Coli per 100ml	Volume Delivered (gallons)	Turbidity	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml	Cover on Container	Residual H_20_2 (mg/l)	E-Coli per 100ml
D 01		25							
D 02									
D 03	> 200		5	Fully Covered	1	2	Fully Covered	1	1
D 04			5	Fully Covered	7	10	Fully Covered	4	100
D 05	> 200		5	Fully Covered	4	2	Fully Covered	4	3
D 06			5	Fully Covered	2	0	Fully Covered	3	0
D 07	> 200		5	Fully Covered	1	2	Fully Covered	1	0
D 08									
D 09									
D 10	> 200		5	Fully Covered	1	7	Plastic	1	1
D 11	> 200		5	Fully Covered	1	2	Fully Covered	1	0
D 12	> 200	50	5	Fully Covered	1	0	Fully Covered	1	0
D 13	> 200	50	5	Fully Covered	1	14	Fully Covered	1	0
D 14			5	Fully Covered	10	0	Fully Covered	1	0
D 15									
D 16									
D 17			5	Fully Covered	1	1	Fully Covered	0	1
D 18	> 200	25	5	Fully Covered	3	0	Fully Covered	0	1
D 19	> 200		5	Fully Covered	2	0	Fully Covered	1	0
D 20	40		5	Fully Covered	1	0	Fully Covered	1	0
D 21	14		5	Fully Covered	1	0	Fully Covered	0	0
D 22									
D 23		50							
D 24	5		5	Fully Covered	1	0	Fully Covered	1	0
D 25	40		5	Fully Covered	1	0	Fully Covered	1	0
D 26	14		5	Fully Covered	1	0	Fully Covered	1	0
D 27	8	50	5	Fully Covered	10	0	Fully Covered	1	0
D 28	> 200		5	Fully Covered	6	0	Fully Covered	1	0

No delivery made on this day

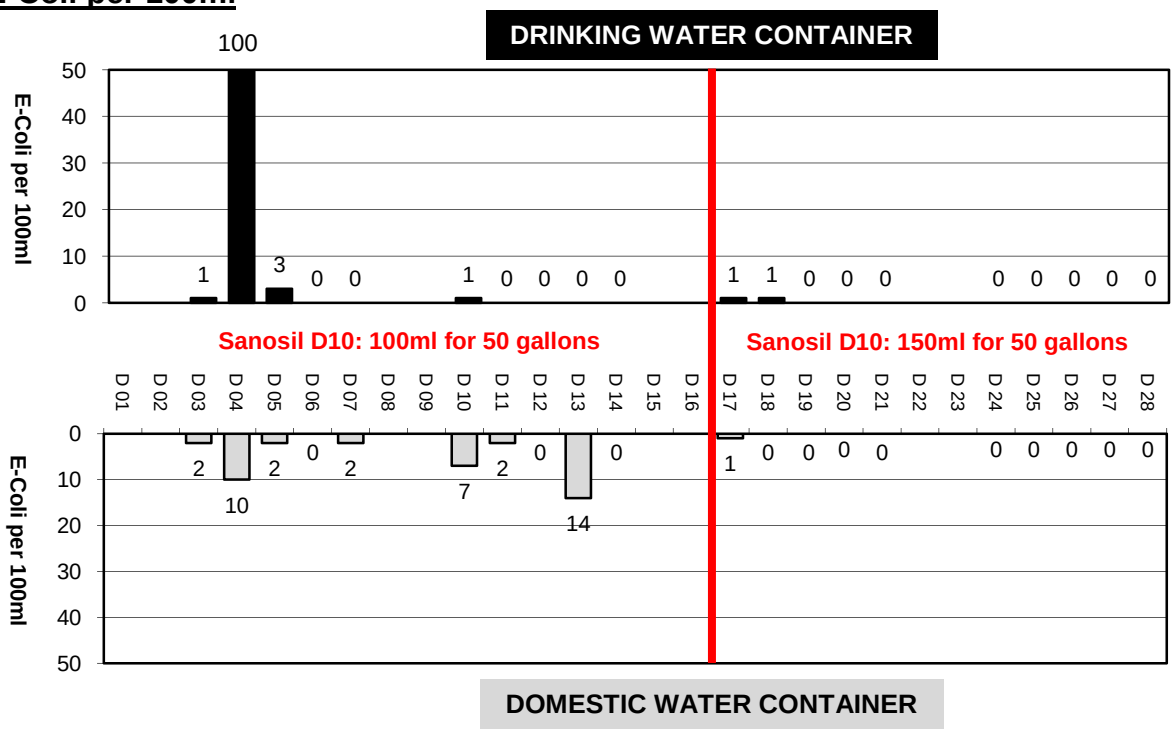
No water testing conducted (weekend)

House Number 5: Water Quality

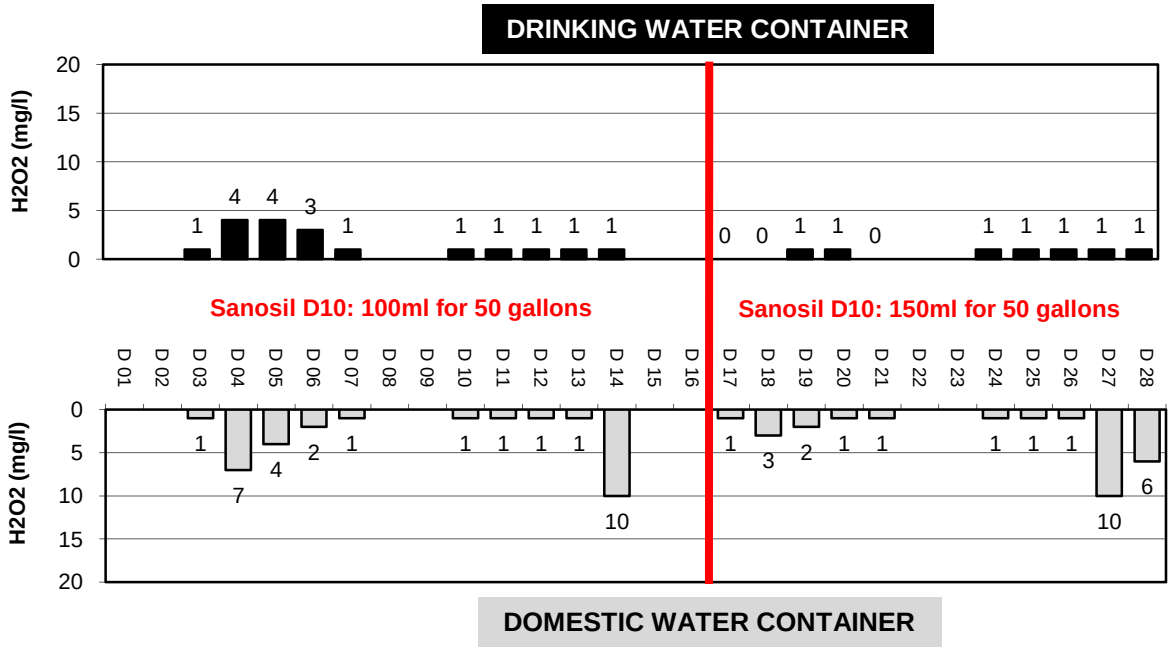
Delivery



E-Coli per 100ml



Residual H_2O_2 (mg/l)



House Number 5: General Water Use Behaviour

GENERAL

Head of Household:	U Zaw Moe Latt
Size of household:	5 members (1 elderly, 2 adults, 2 children)

DELIVERIES

Number of deliveries:	6 days out of 28 (21%)
Total volume delivered:	1,125 litres (250 gallons)
Average volume delivered:	190 litres (42 gallons)
Average daily HH water use:	40 litres / household / day (8.9 gallons/day)
Average daily water use:	8 litres / person / day

STORAGE OF DOMESTIC WATER

Domestic Storage Container:	2 x 50-gallon, glazed ceramic water storage container
Storage habits:	Use both containers – no preference
Cover/uncovered:	Fully covered (100%)
Time when refilled:	Tend to almost exhaust supply before buying more

DRINKING WATER CONTAINER

Type of container:	Plastic container fitted with a cover and tap
Utensil for transferring water to container:	Bowl / scoop without a handle
HH water treatment:	Strained through a cloth
Cover/uncovered:	Fully covered (100%)
Utensil for removing drinking water:	Container fitted with a tap

Summary of House 5

House number 5 purchased water on only 6 occasions; a total of 250 gallons. As with the other households in this study, rainwater was collected between days 7 and 10 and used as the primary drinking water source until it was exhausted. The household stored their domestic water in two 50-gallon glazed ceramic jars which they keep covered indicating a basic awareness of contamination issues.

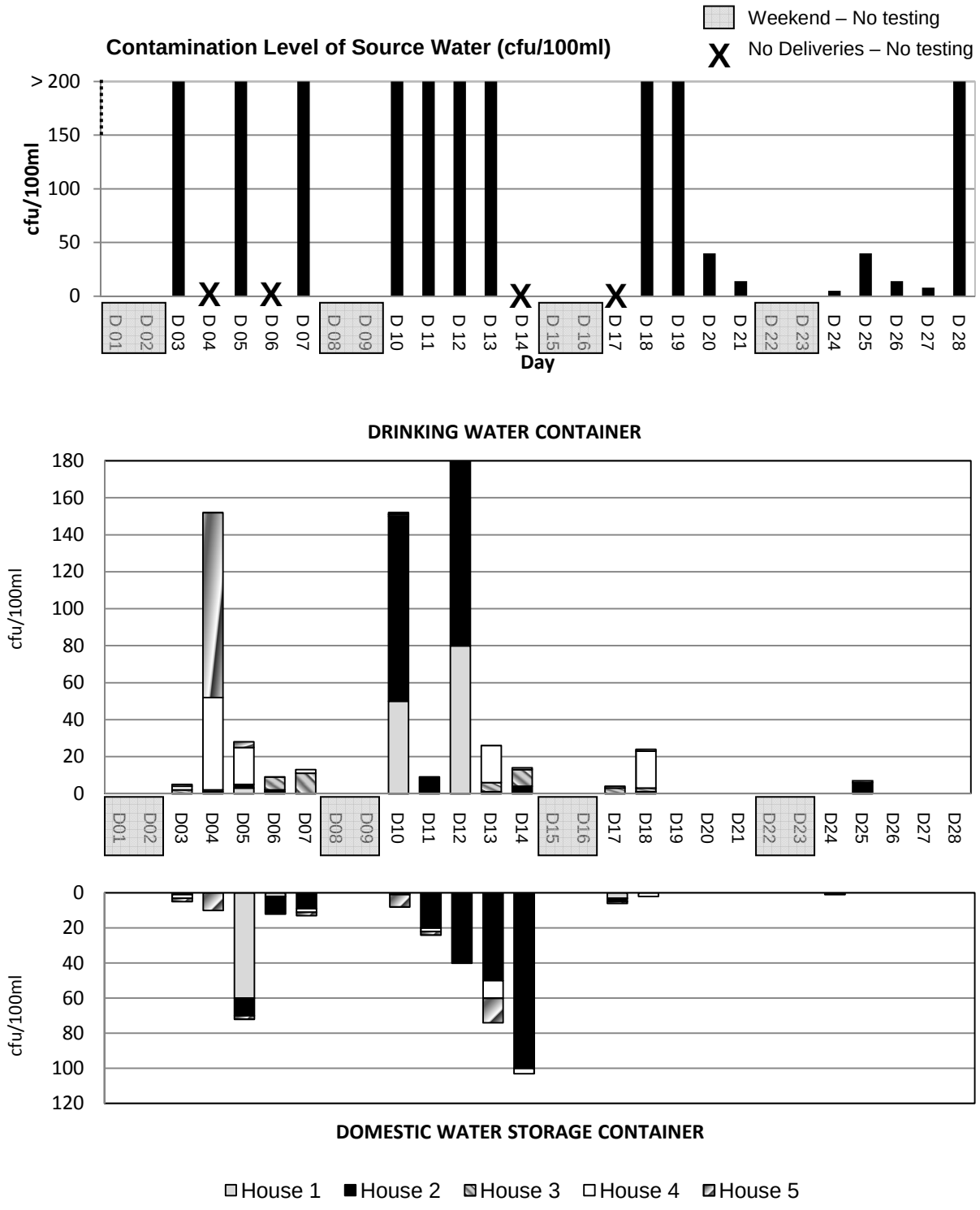
Water was transferred to the household drinking water container using a bowl, strained through a muslin cloth and stored in a plastic container fitted with a tap. Throughout the 28-day study, this container was always observed to be covered. Drinking water was extracted from the plastic container via a tap which reduces the risk of contamination.

Significant bacteriological contamination was only detected on day 4 of the study (100 cfu/100ml) in the household drinking water container. Residual H_2O_2 was recorded at very low levels throughout the study both in the domestic storage container and the drinking water container.

5.3.3 Summary of the Water Quality Results

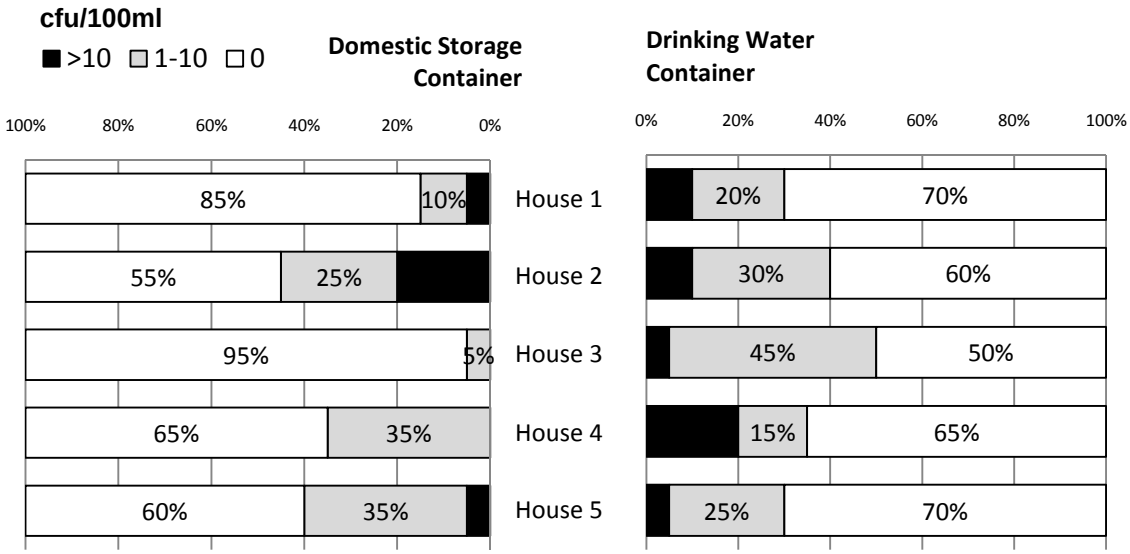
The source water from Dedaye's central community pond was highly contaminated with faecal matter as indicated by the proxy indicator E-coli for three of the four weeks of the study. Why contamination reduced to levels below 50 cfu/100ml between days 20 and 27 is unclear.

The three charts below provide a summary of the bacteriological contamination of the source water as well as from both the domestic water storage containers and the household drinking water containers from each of the 5 participating households.



There were three days during the study when significant bacteriological contamination was recorded in household drinking water; days 4, 10 and 12. However, throughout the study, no incidence of severe diarrhea was reported. On day 4, high levels were recorded in houses 4 and 5 while on days 10 and 12 when all participating households were using rainwater, high levels were recorded in houses 1 and 2.

Faecal contamination in excess of 10 coliform units per 100ml (cfu/100ml) was recorded by only 10% of tests while 27% revealed between 1 and 10 cfu/100ml which was considered to be within the tolerance levels of participating households and 63% were bacteria free. A breakdown of e-coli tests for all 5 households is presented below for both the domestic drinking water containers and the household drinking water containers.



Faecal contamination detected domestic water containers and drinking water containers

Almost all of the faecal contamination was detected during the first half of the study when a lower dose of Sanosil D10 was used to treat the pond water (11mg/l H_2O_2). Once the dosage was increased by 50% to 17mg/l H_2O_2, contamination in excess of 10 cfu/100ml was only detected on one occasion (2% of tests conducted in the second half of the study) while minor contamination of between 1 to 10 cfu/100ml was detected on 7 occasions (14% of the tests conducted in the second half of the study).

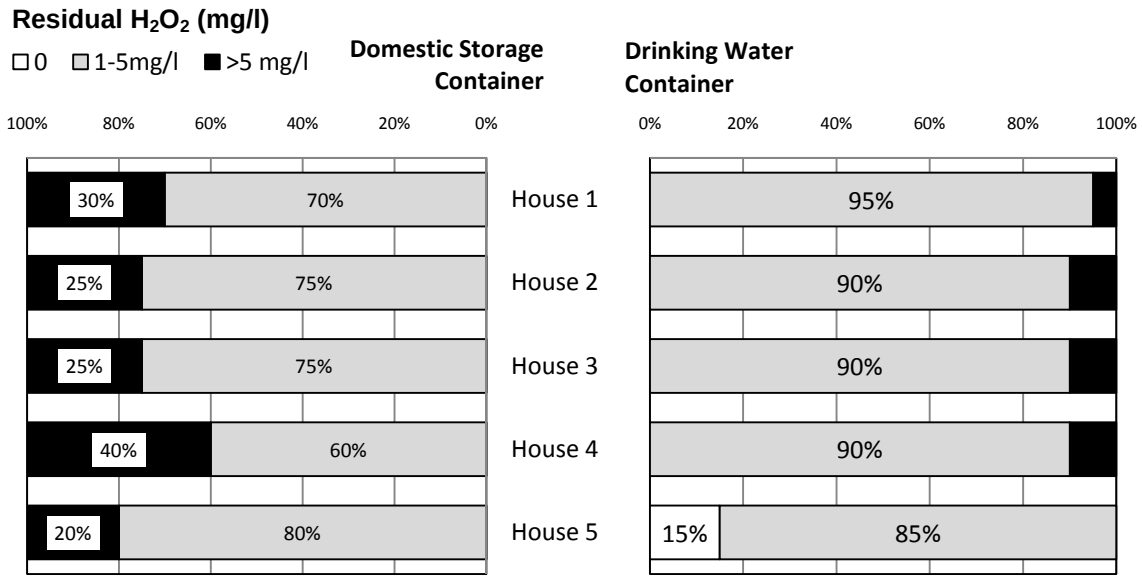
Residual concentrations of hydrogen peroxide were detected throughout the study in both the domestic storage containers and the drinking water containers of all households. However, despite doubling the dose of H_2O_2 in the second half of the study, the residual concentrations detected in the drinking water container remained low.

A total of 28% of tests conducted on the domestic water containers detected residual concentrations in excess of 5mg/l while the other 72% of tests detected concentrations of between 1 and 5mg/l. During the first two weeks of the study when concentrations of 11mg/l H_2O_2 were used, residual H_2O_2 concentrations in excess of 5mg/l were detected in 22% of tests conducted on water in the domestic storage containers. When the dose was increased to a concentration of 17mg/l, this increased by 50% to 34% of tests while all other tests detected levels of between 1 and 5mg/l.

Tests for residual H_2O_2 concentrations conducted on the drinking water containers revealed slightly lower concentrations as would be expected if the residual H_2O_2 was continuing to treat the drinking water after secondary contamination. A total of 7% of tests revealed concentrations of greater than 5mg/l, 90% of tests detected between 1 and 5mg/l and 3% were unable to detect any residual H_2O_2 in the drinking water container.

Although residual concentrations of H_2O_2 were detected by all the tests conducted on the domestic water storage containers and 97% of tests on the drinking water containers, it remains questionable whether the Palintest reagent used (H_2O_2 MR: 0-100mg/l) was sensitive enough to detect very low residual concentrations. For future experiments, low concentrations will be cross checked against results using Palintest H_2O_2 LR 0-2mg/l reagent.

The following charts present a summary of the residual H_2O_2 concentrations detected in each of the 5 participating households for both the domestic water storage containers and the household drinking water containers.



Residual H_2O_2 concentrations for domestic storage containers and drinking water containers

5.3.4 Multiplier Effects

In the peri-urban context of Dedaye town, despite having a drinking water taste preference for community ponds, users tend to have a high level of awareness concerning the health risks associated with the poor quality of the water. Interviews with water vendors involved in this pilot revealed that although the project was very small, involving only 5 households, word quickly spread through the neighbourhood regarding a new water treatment product, without taste or smell, being able to purify pond water.

Throughout the month of the project, beneficiary households enthusiastically monitored the quality of their treated water demanding updated results from the Oxfam technicians who conducted the daily testing. It appears these results were informally disseminated throughout the neighbourhood as water vendors claimed to be constantly pestered by non-beneficiary households wanting to participate in the pilot project. When it was explained that the quantity of Sanosil currently available was only sufficient to cover the requirements of the pilot project, some households attempted to entice the vendor into selling them Sanosil.

6.0 Conclusion

The source water, from central Dedaye's community drinking water pond, was highly contaminated with levels in excess of 200 cfu/100ml regularly detected throughout the study. The only form of household improvements made to drinking water was natural sedimentation in the domestic water storage jar and straining through a muslin cloth at the time water is transferred to household drinking water container. Whilst these efforts may contribute to reducing bacteriological contamination through reducing turbidity and thus potential breeding grounds for bacteria, these methods are insufficient to reduce bacteriological loads to acceptable levels i.e. below 10 cfu/100ml.

Levels of faecal contamination detected in drinking water container during this pilot study were below 10 cfu/100ml in 90% of cases while many of the higher levels detected could be attributed to the use of untreated rainwater.

Sanosil appears to have a great potential for household water treatment using highly contaminated water sources. The unique combination of hydrogen peroxide and silver ensures a stable compound which is able to maintain residual concentrations of hydrogen peroxide for at least as long as it takes a household to empty a 50-gallon container. Interviews with all 5 of the participating households revealed not only a strong demand to keep using Sanosil but also a willingness to pay for the product. In addition, many residents of Dedaye not participating in the pilot study have shown a great interest in the product.

Whilst this pilot study proved that Sanosil treated water delivered by water vendors from highly contaminated sources can effectively produce 'safe' drinking water at the point of consumption without requiring additional behaviour changes from target beneficiaries, adjustments are required to the initial Sanosil concentrations before the product should be marketed to a wider audience. To ensure a greater likelihood of adequate residual concentrations of hydrogen peroxide able to withstand recontamination during storage and transfer to the household drinking water container as well as recontamination from using dirty utensils for removing water, a higher concentration of Sanosil is required to treat the source water.

In mid-2011, Oxfam GB will scale-up in Dedaye encouraging all full-time water vendors in the Town to offer Sanosil treated water to their customers. The project will be funded under the Oxfam GB, 2011 Innovation Fund and if successful will develop a model for scale-up by the private sector in other urban and peri-urban areas of Myanmar.

Annex A: GUIDELINES FOR PILOT FIELD TEST OF HYDROGEN PEROXIDE DOSING OF WATER CARTS

Background; Previous experiments revealed that Sanosil D10 can effectively kill E-Coli bacteria, a proxy indicator for faecal contamination at doses of 100ml 2.5% H_2O_2 (11mg/l), 25ppm silver for 50-gallons of pond water and still leave a residual level of H_2O_2 which will continue to act if the water is re-contaminated. The key question that this experiment will attempt to answer is to what extent this residual level of H_2O_2 is able to continue acting under normal use. Is it able to endure recontamination during transportation and storage in the household drinking water container and still be able to provide safe drinking water at the point of consumption?

Objective: To determine whether pond water treated with hydrogen peroxide can effectively provide safe drinking water at the point of consumption.

Dosing: Each 50-gallon delivery of pond water will be dosed with 100ml of 2.5% hydrogen peroxide; 25ppm silver (Sanosil D10).

Methodology

A Identification of 5 Target Households to Participate in the Field Test

The following criteria will be used to identify the 5 households that will participate in the field test trials:

Criteria

1. The household has completely exhausted its supply of rainwater for drinking water purposes
2. The household is currently purchasing all their domestic water from vendors of pond water
3. The household is drinking pond water without treatment such as filtration using a sand filter or ceramic water filter or boiling prior to consumption. Straining the water through a muslin cloth or the use of alum is permissible.
4. The household uses a maximum of two, domestic water storage containers
5. The household is willing to participate in the experiment and the head of household is willing to sign a consent form

Discussions with the water vendors have already pre-identified 5 households to participate in this study. All 5 households have voiced an interest in the new water treatment method and have volunteered to participate in the study.

B Baseline Survey of Target Households

To establish baseline data regarding water use and hygiene practices, a household survey will be conducted with these 5 target households on Thursday 7th January 2011 to ensure they comply to the criteria stated above as well as to gain insight into their current water use and hygiene practices which will assist in the analysis of the water quality testing data.

[see Annex 01: Baseline Survey]

C Meeting of Heads of Target Households and Water Vendors

Before beginning the pilot study a meeting will be held with the heads of the target households (and any other household members that wish to attend) as well as the water vendors participating in the study. The following issues will be covered:

- Aims and objectives of the pilot study
- An overview of the study – how Oxfam intends to achieve the objectives
- Roles and responsibilities of
    - Households
    - Water vendors
    - Oxfam
- Presentation of the monitoring forms to be used by the households and the water vendors
- Signing of a consent form for ALL households participating in the pilot study

D Delivery of Domestic Water

The 5 households will receive deliveries of pond water in their usual manner i.e. in the mornings usually between 8am and 10am and at the standard market price of 500 MMK for 50-gallons for untreated water. The pond water will be treated by the water vendor in the household compound rather than at source to ensure that only these 5 households receive treated water. No additional cost will be charged to the households participating in the study for the treatment with hydrogen peroxide and silver.

Deliveries will begin on Saturday 12th March 2011 and will continue until Friday 8th April 2011.

The first delivery of treated water will occur two days before testing begins. This delivery will be provided free of charge and all the domestic water stored in the household will be replaced with treated water. To ensure this process is conducted as simply as possible, the household will be informed at least 2 days prior to this date so that they can refrain from over-purchasing water which will be discarded at the beginning of the experiment.

A daily record of deliveries will be kept by the water vendor. This data will be provided to the Oxfam water quality technician on a daily basis after morning deliveries. The water vendor will also provide the technician with a 1-litre sample of the source water taken directly from the pond and NOT from the water cart. This sample will be kept refrigerated until all household samples are collected by the Oxfam water quality technician in the afternoon (see section C below).

The information collected will include:

- Water source
- Time of dosing
- Dose of H_2O_2 provided
- Volume of water delivered
- Types of containers filled with treated water
- Number of containers either filled or partially filled
- Volume of water in the storage container at the time of delivery
- Whether the container was covered, partially covered or uncovered at the time of delivery

(see Annex 02 for the monitoring form for daily deliveries and Annex 03: Water Vendors Daily Monitoring Form)

Note that deliveries of pond water occur on a daily basis, 7 days a week. The monitoring forms for weekend deliveries will be collected on Monday morning along with the Monday delivery. No water sample will be taken on either a Saturday of Sunday.

E Monitoring of Water Transferred to the Drinking Water Container

To understand the limits of parameters affecting the effectiveness of hydrogen peroxide and silver on providing safe water at the point of consumption, it will be necessary to monitor how and when drinking water is transferred from the storage container to the drinking water container. Participating households will be required to monitor these transfers using a monitoring form

Each time water is transferred to the drinking water container, the household will be required to record:

- The date
- The time of the transfer
- The domestic water storage container from where the water was transferred
- The utensil used to transfer the water
- The volume transferred

In addition, the household will also be required to monitor the cleaning of water containers and utensils.

[see Annex 04 for the household monitoring form].

F Water Quality Testing

i) Sample Codes

Each water sample will be given a unique code which will provide information concerning the DAY (D) the sample was taken, the house (H) it was taken from and the location i.e. the water storage container (S), the household drinking water container (D) or whether it was taken from the pond source (P)

e.g. D14H3S2 is a sample taken on DAY 14 at HOUSE 3 from the WATER STORAGE CONTAINER #2

D5P2 is a sample taken on DAY 5 from the POND (the SECOND sample from same source)

ii) Sampling at the household

Water quality testing will be conducted on a daily basis (Monday-Friday) for a 4-week period beginning on Monday 14th March 2010. Three water samples will be taken daily from each household at around 1-2pm and tests conducted to determine the E-coli count per 100ml as well as the residual level of H_2O_2:

Sample 1: Domestic water storage container 1

Sample 2: Domestic water storage container 2

Sample 3: Household drinking water container

Samples 1 & 2: Domestic water storage container

Water will be extracted from the water storage containers using a sterile collection container. To simulate normal use i.e. the way water would normally be transferred to their drinking water container, this sample will be taken from the upper layer of the storage containers.

At the time of sampling from these containers, the following information will be collected by the Oxfam water quality technician

- Time of sampling
- Time the water was delivered (NB: may have been on a previous day)
- Whether the container is fully covered, partially covered or uncovered
- Volume of water contained in the storage container
- What is being used by the HH to remove water from the container
- Other observations which may affect water quality

[see Annex 05: Water sampling record sheets from households]

Sample 3: Household drinking water container

Water will be extracted from household drinking water container in one of two ways depending on the type of container. If the container has a tap at the bottom, water will be sampled from the tap using a sterile collection container whereas if there is no tap, water will be sampled in the same way from the top of the container.

At the time of sampling, the following information will be collected by the Oxfam water quality technician:

- Time of sampling
- When the container was last filled from the water storage container
- Whether the container is covered
- The type of container used to fill the container
- The method that water is removed from the container for drinking
- Whether the household have done anything to improve the taste of the water other than sedimentation
- Other observations which may affect water quality

[see Annex 05: Water sampling record sheets from households]

iii) Processing of Water Samples

Water samples will processed each afternoon a maximum of 4 hours after the delivery of treated water as previous experiments revealed that it can take up to 4 hours for the H_2O_2 to effectively kill the bacteriological contaminants in pond water.

Samples will be processed in the Oxfam office by the Oxfam water quality technician using an Oxfam Del Agua kit for bacteriological testing and a WagTech 7100 photometer for testing residual H_2O_2 levels.

A total of 17 samples will be tested for E-coli levels (3 samples from each of the 5 household containers plus two samples of pond water) while tests for residual H_2O_2 will be conducted on the 15 household samples.

[see Annex 07: Data collection sheet for water quality testing]

iv) Physical Parameters for Water Quality Testing

In addition to killing all pathogens, Sanosil D10 may also improve the aesthetics of pond water. Consequently, the physical parameters of taste, odour and colour will also be assessed for all water samples. A coding system for both the intensity and the nature of tastes and smells is presented in annex 07

[see Annex 09:Coding system for the physical water testing parameters of taste and smell]

G Monitoring and Reporting

The following monitoring forms must be completed a filed on a daily basis

i) Water vendor's record of delivery to target households [Annex 03]

ii) Household record of transfers to drinking water container and the cleaning of containers and transfer utensils [Annex 04]

iii) Water sampling record sheets from households [Annex 06]

iii) Daily data collection sheet of the processing of water samples [Annex 07]

The details from all these sheets must be input into an excel database on a daily basis and email to both the WASH Officer in Dedaye and the National Public Health advisor in Yangon.

As this is a pilot project using a new method of water treatment in Myanmar (Sanosil D10), it is imperative that the WASH team in Dedaye fully communicate their findings and concerns at all points during the study. Consequently, a verbal report will be made to the National Public Health Advisor on a daily basis by the WASH officer in Dedaye

The final report of the study will be written by the National Public Health Advisor.

List of Annexes for Guidelines

Annex 01: Baseline Survey

Annex 02: Technician's Monitoring Form for Daily Deliveries to 5 target households

Technicians will need one form per day i.e. 7 forms per week.

The form is 2 pages and should be printed back-to-back for simplicity

Total required = 28 copies

Annex 03: Water Vendors Daily Monitoring Form

Water vendors will need one form per day i.e. 7 forms per week.

Total required = 56 copies

Annex 04: Monitoring Form for Households

Each households will complete this form each time water is transferred to the drinking water container

Data will be collected by the Oxfam technicians on a daily basis

The form will be replaced when necessary

Approx 25 copies required

Annex 05: Household Water Sampling Form

Oxfam's water quality technician will require one form per HH per day i.e. 5 forms per day

The form is 2 pages and should be printed back-to-back for simplicity

Total required = 100 copies

Annex 06: HH Cleaning Form

This form will be completed by Oxfam Technicians on a daily basis

Total required = 20 copies

Annex 07: Data collection sheet for water testing

Oxfam's water quality technician will require one form per day

Total required = 20 copies

Annex 08: Work Schedule

A Day-by-day schedule

B Details of daily tasks for the water vendor and Oxfam's water quality technician

Annex 09: Coding System for the Physical Water Testing Parameters of Taste, Odour & Colour

SUMMARY OF ANNEXES

MONITORING FORMS

The following table is designed to assist Oxfam's technicians prepare all the monitoring forms in advance**.**

Annex	Name	Language	Completed by	Frequency Used	Number of copies required	Printing Requirements
Annex 01:	Baseline Survey	English	Technicians	-	5	Back to Back
Annex 02:	Technician's Monitoring Form for Daily Deliveries to 5 target households	English	Technicians	Daily	28	Back to Back
Annex 03:	Water Vendors Daily Monitoring Form	Myanmar	Water vendors	Daily	56	-
Annex 04:	Monitoring Form for Households	Myanmar	Households	Each time water is transferred to DW container	25	-
Annex 05:	Household Water Sampling Form	English	Technicians	Weekdays ONLY	100	Back to Back
Annex 06:	HH Cleaning Form	English	Technicians	Weekdays ONLY	20	-
Annex 07:	Data collection sheet for water testing	English	Technicians	Weekdays ONLY	20	-
Annex 08:	Work Schedule Roles & Responsibilities	English	-	-	-	-
Annex 09:	Coding System for Physical Parameters: Taste, Odour & Colour	Myanmar	-	-	-	-

Note:

- Hard copies of all monitoring forms must be kept
- Each completed monitoring form should be stored in a separate file
- The excel database must be updated on a daily basis and a copy sent to the National Public Health Advisor by email

Baseline Data of 5 Target Households

Background

In Dedaye town, Ayeyarwaddy Division, the majority of households have their domestic water delivered to their household by water vendors. These vendors collect water from community drinking water ponds and deliver it untreated. Water use and hygiene practices are very low in the target area and the majority of users drink this water without further treatment other than sedimentation and straining it through a muslin cloth when transferring it to the household drinking water container. Consequently, the target population is at high risk to waterborne illnesses, particularly those under 5-years-old who have limited resistance.

In an attempt to mitigate this risk with the minimum behavior change necessary, Oxfam GB will conduct a pilot project targeting 5 households. Pond water treated with Sanosil D10 (2.5% hydrogen peroxide; 25ppm silver) will be delivered to each household by local water vendors for a one-month period and water will be tested for bacteriological contamination and residual hydrogen peroxide concentrations daily at both the domestic water storage container and at the point of consumption; the household drinking water container. The pilot study aims to determine whether it is possible for the water vendors to treat pond water with Sanosil D10 at the point of delivery with sufficient residual levels to provide safe water at the point of consumption without requiring behavior change of the target households.

Introduction

Five households were identified using the following criteria:

- Exhausted its supply of rainwater.
- Purchases all domestic water from vendors of pond water.
- Drinks pond water without treatment such as filtration, a sand filter or ceramic water filter or boiling prior to consumption.
- Has a maximum of two, domestic water storage containers.
- Is willing to participate in the study and the head of household is willing to sign a consent form.

One female respondent was interviewed from each household on 7th January 2011 to establish baseline data on water use and hygiene practices as well as the health status of target beneficiaries (see Annex 1: Baseline Survey Form). A summary of the findings of this survey are presented below

A Demographics

The 5 target households have a total of 30 family members (females = 17 [57%]; males = 13 [43%]). The average household size is 6 family members with sizes ranging from 4 to 9 family members. The majority are adults (63%) while 3 households each have one elderly woman and 4 houses have a total of 6 children between the ages of 5 and 18-years-old. Only one of the target households (H2) has children under 5-years-old.

The table below presents a gender breakdown of the demographics of the 5 target households.

House code	Head of Household	Elderly (>65yrs)			Adults (18-65yrs)			Children (5-18yrs)			Infants (<5rs)			TOTAL		
		Female	Male	TOTAL	Female	Male	TOTAL	Female	Male	TOTAL	Female	Male	TOTAL	Female	Male	TOTAL
H1	U Thein Win				2	4	**6**							2	4	**6**
H2	U Zaw Tun				1	1	**2**		2	**2**	2		**2**	3	3	**6**
H3	Daw Than Than Aye	1		**1**	2		**2**		1	**1**				3	1	**4**
H4	Daw Khin Than	1		**1**	3	4	**7**	1		**1**				5	4	**9**
H5	U Zaw Moe Latt	1		**1**	1	1	**2**	2		**2**				4	1	**5**
		3		**3**	9	10	**19**	3	3	**6**	2	-	**2**	17	13	**30**
				10%			**63%**			**20%**			**7%**	57%	43%	

B Domestic Water Storage

Each of the 5 target households use two, glazed, ceramic water storage jars providing a minimum storage capacity of 100 gallons (450 litres). This type of storage container is found in the majority of households in Dedaye town and glazed, ceramic jars are generally preferred all over Myanmar for the storage of domestic water.

There is generally no pattern of water use from the two containers; users remove water from either of the containers for all domestic uses. However, one house (H2), with 4 children, reserves one storage container for all its drinking water which it keeps covered.

Although the target households have covers for their water containers indicating some level of awareness to protect the water from contamination, the basic water use practices relating to cleaning practices and transfer methods do not indicate a thorough awareness of safe water use practices. Soap is not used to regularly clean either the storage container or the utensil for removing water from the storage container indicating that the domestic water supply is highly prone to recontamination.

The table below presents a summary of the domestic water storage for the 5 target households.

House Code	Water Storage Containers							Utensil for removing water	
	ceramic jars	Jar Size (gallons)	Storage capacity (gallons)	Covers	Drinking water storage	Cleaning method	Frequency of cleaning	Utensil	Frequency of cleaning
H1	2	50	100	Both	Both containers	Water & Cloth	Every 2-3 days	Bucket	Each time its used
H2	2	70	140	ONLY 1	ONE container	Water ONLY	Every 2 weeks	Scoop without a handle	Each time its used
H3	2	50	100	Both	Both containers	Water & Cloth	Once a week	Bucket	Each time its used
H4	2	50	100	Both	Both containers	Water ONLY	Each delivery	Bucket	Each time its used
H5	2	50	100	Both	ONE container	Water & Brush	Once a week	Scoop without a handle	Each time its used

C Delivery by Water Vendors

With a storage capacity of between 100 and 140 gallons (450-630 litres) and an average of 6 family members, it is not necessary for the majority of households to receive daily deliveries of water from the vendor. Only one of the target households (H4), with 9 household members, usually receives daily deliveries. On average, each household receives a delivery of 30 gallons (135 litres) every other day.

In Dedaye town, domestic water from community ponds is delivered at a unit cost of 500 MMK ($0.63) for 50 gallons and each household purchase between 9 and 19 litres per person per day; a total weekly expenditure of between 1,200 MMK ($1.5) and 2,100 MMK ($2.5) per household per week. This water is used for most domestic uses except laundry which is usually done at the river.

Below is a table summarizing the average weekly deliveries to the 5 target households.

House Code	Water Source	Average Delivery			Average Weekly Delivery					
		Frequency	Volume Purchased	Cost per delivery	Number of deliveries	Volume delivered		Vol. /person/day		Total cost
						gallons	Litres	Gallons	litres	
H1	Pond	Every 2 days	30 gallons	300 MMK	4	120	540	2.9	13	1,200 MMK
H2	Pond	Every 2 days	30 gallons	300 MMK	4	120	540	2.9	13	1,200 MMK
H3	Pond	Every 2 days	30 gallons	300 MMK	4	120	540	4.3	19	1,200 MMK
H4	Pond	Daily	30 gallons	300 MMK	7	210	945	3.3	15	2,100 MMK
H5	Pond	Every 5 days	50 gallons	500 MMK	1-2	70	315	2	9	700 MMK

E Water Transfer from the Water Storage Container to the Drinking Water Container

There is a significant difference of opinion amongst the 5 target households concerning the safety of the water delivered by the water vendors; two households reported the water as unsafe while the other 3 regard it as safe to drink. Despite two households recognising that the delivered water might not be safe, the only methods to improve the water quality, which is practiced by all target households, are sedimentation and straining through a muslin cloth when transferring the water to the drinking water container.

The average sedimentation times varies depending on the availability of water. However, it should be noted that house 2, which reserves one its storage container for drinking water use, leaves its water to sediment for approximately one week prior to use.

All the target households use either a bucket of a scoop without a handle to transfer water from the domestic storage container to the drinking water container. While these utensils increase the likelihood of contaminating the container from either contact with hands or from the containers themselves, all households claim to clean the utensil before use. However, it should be notes that only one of the five target households (H5) uses soap to clean its utensils and containers..

The table below presents a summary of data relating to the transfer of drinking water to the household drinking water container for each of the 5 target households.

House Code	Respondent's opinion of pond water	Average Sedimentation time before transfer	Utensil for transfer to drinking water container		HH methods for improving water quality
			Type	Cleaning Frequency	
H1	Unsafe	3 days	Bucket	Each time it is used	Strain through cloth
H2	Safe	7 days	Bucket	Each time it is used	Strain through cloth
H3	Safe	5 days	Scoop without a handle	Each time it is used	Strain through cloth
H4	Safe	2 days	Bucket	Each time it is used	Strain through cloth
H 5	Unsafe	5 days	Scoop without a handle	Each time it is used	Strain through cloth

F Household Drinking Water Container

Four of the five households (80%) use a traditional ceramic pot to store their drinking water in the household while one house (H5) uses a metal container. The standard drinking water container is 12-18 litres while one house (H2) uses a 48-litre ceramic pot. All 5 households use a cover for their drinking water container and claim to clean the container each time it is refilled. However, only one household (H5) using a metal container clean their container using soap. The others use water only and clean it with a brush or a cloth.

The table below presents a summary of each drinking water storage container in each household.

House Code	Type	Number	Size of container		Storage capacity per person	Cover	Frequency of Cleaning	Materials used for cleaning
			(gallons)	(litres)	(litres)			
H1	Ceramic	1	4	18	3	Yes	Each time it is filled	Water & brush
H 2	Ceramic	1	11	48	8	Yes	Each time it is filled	Water & cloth
H 3	Ceramic	1	4	18	4.5	Yes	Each time it is filled	Water ONLY
H 4	Ceramic	1	4	18	2	Yes	Each time it is filled	Water & Brush
H 5	Metal	1	2.7	12	2.4	Yes	Each time it is filled	Water & Soap

G Diarrhoea Incidence

All the target households claim that diarrhoea occurs rarely in their household during the cool season despite drinking untreated pond water and no incidences of severe diarrhoea were reported in the two weeks prior to this survey. As bacteriological testing of the pond source revealed levels of contamination of E-coli in excess of 100 cfu/100ml[2], either the family members of the target households have a high tolerance to faecal contamination or that levels are significantly reduced during sedimentation and straining prior to consumption.

On the rare occasions when a family member suffers from severe diarrhoea, household tend to opt for providing the patient with a serum drip. This is most likely because all target households live in close proximity to both the township hospital and local private clinics.

The table below presents a summary of diarrhoea incidence during the cool season for the 5 target households.

House Code	Diarrhoea incidence this season				Diarrhoea incidence in the past 2 weeks				Treatment Method
	Elderly (>65yrs)	Adults (18-65yrs)	Children (5-18yrs)	Infants (<5yrs)	Elderly (>65yrs)	Adults (18-65yrs)	Children (5-18yrs)	Infants (<5yrs)	
H1	-	Rarely	-	-	-	0	-	-	Nothing 0
H2	-	Rarely	Rarely	Rarely	-	0	0	0	Serum drip
H3	Rarely	Rarely	Rarely	-	0	0	0	-	Serum drip
H4	Rarely	Rarely	Rarely	-	0	0	0	-	Serum drip
H5	Rarely	Rarely	Rarely	-	0	0	0	-	Serum drip

Conclusion

The demographics of the target group are suitable for this study. Whilst the majority are adults (63%), there is a sufficient number in higher risk groups such as the elderly (10%), children 5-18 years-old (20%) and infants under 5-years-old (7%).

The water use and hygiene practices of the target households are typical when compared to previous knowledge attitudes and practices (KAP) surveys conducted by Oxfam in Dedaye Township. Whilst there appears to be some knowledge of these issues, indicated by the fact that all households have covers on their water containers, poor water handling practices prevail, increasing the likelihood of recontamination from contact by hands during transfer or from containers that are not regularly or properly cleaned.

During the one-month study, all domestic water supplied to each household will be treated with Sanosil D10. Households will purchase this water from vendors at the standard local rate of 500 MMK ($0.63) for 50 gallons and water will be tested for bacteriological contamination as well as residual hydrogen peroxide concentrations on a daily basis (Mon-Fri) at both the domestic water storage container and at the point of consumption. In order to fully analyze the results of the water quality testing, both the water vendors and the target households will participate in daily monitoring of water use and hygiene practices.

By the end of the one-month study, it is hoped that it will be possible to determine whether pond water treated with Sanosil D10 at the time of delivery can provide safe water at the point of consumption with limited behavior change of the target population.

[2] WHO maximum guideline value for rural drinking water in developing countries is 10 coliform units (cfu) per 100ml

Annex 01a: Baseline Survey Form

Date	__ / 01 / 11	Head of Household		House Code	H __

Household Members

Qu01

a) Ask the respondent about the **total number of people** (all adults and children) living in the household. Then ask by gender

b) Ask about the number of elderly, adults, children and infants separately.

(Check that the total number living in the house is the same as the elderly + adults + children + infants)

People living in the household	Female	Male	Total
TOTAL			
Elderly (over 65 years)			
Adults (18-65 years)			
Children (5-18 years)			
Children (under 5 years)			

Water Sources

Qu02
Ask the respondent where the household get its domestic water during this season?

PROBE to ensure respondent mentions all the water sources used by the household

Water Source	Can tick more than 1	
	Delivered by a water vendor	Collected by household
Pond		
Borehole		
Open Well		

Qu03 Ask the respondent,

a) How often they usually purchase water?

b) How much water they usually purchase for the average delivery?

c) How much they pay for each delivery of water?

Frequency of Purchase	Average Purchase		Cost per Delivery
	Buckets	Gallons	
Every _____ day(s)			

Qu04
Ask the respondent to estimate the average volume of water purchased in a week?

Number of Deliveries in a week	Total Weekly Volume Delivered		Weekly Cost
	Buckets	Gallons	

Domestic Water Storage Container

Qu05
Ask the respondent about all the water storage containers they use for their domestic water.

a) type of container
b) Size of the container
c) Whether the contain has a cover
d) Note the number of covers

Type of Domestic Water Storage Container	Number of Containers	Size of containers (gallons)	Cover
Ceramic jar			Yes ☐ # Covers ___ No ☐
Plastic			Yes ☐ # Covers ___ No ☐
Metal			Yes ☐ # Covers ___ No ☐
Other.			Yes ☐ # Covers ___ No ☐
TOTAL STORAGE CAPACITY		gallons	

Qu06 Ask the respondent if they always use the same storage container for storing water used for drinking water	Yes ☐ No ☐	If Yes, which container is used to store ALL drinking water?	

Qu07
Ask the respondent what they use to remove water from the water storage container?

Method of removing water	Can Tick more than 1
Bucket	☐
Scoop with a handle	☐
Bowl / scoop WITHOUT a handle	☐
Other	☐

Qu08 Ask the respondent **how often they usually clean** their water storage containers?	Frequency of Cleaning	Tick 1 ONY
	Every time water is delivered	☐
	Every 2 or 3 days	☐
	Once a week	☐
	Once every 2 weeks	☐
	Less than once every 2 weeks	☐

Qu09 Ask the respondent **what they usually use to clean** their water storage container?	CLEANING MATERIALS	Tick ONLY 1
	Water ONLY	☐
	Water & soap & (cloth or brush)	☐
	Water & cloth ONLY	☐
	Water & brush ONLY	☐
	Other (specify)	☐

Transfer of water from the storage container to the household drinking water container

Qu10 Ask the respondent what they think about the safety of the water they drink	Safe ☐ Unsafe ☐ Don't know ☐

Qu11 Ask the respondent how long they usually leave water to sediment before transferring it to their drinking water containers	____ days

Qu12 Ask the respondent **what they use to <u>transfer</u>** drinking water from the domestic water storage container to the household drinking water container	Method of removing water	Can Tick more than 1
	Bucket	☐
	Scoop with a handle	☐
	Bowl / scoop WITHOUT a handle	☐
	Other	☐

Qu13 Ask the respondent **how often they usually clean <u>the utensil used to transfer</u>** drinking water to the household drinking water container	Frequency of Cleaning	Tick 1 ONY
	Each time it is used	☐
	Twice a day	☐
	Whenever it looks dirty	☐
	Once a day	☐
	Less than once a day	☐

Qu14 Ask the respondent if they do anything to improve the quality of their water before drinking it	Yes ☐ No ☐	If Yes, what do they do?	

Household drinking water container

Qu15 Ask the respondent about all the drinking water containers a) Type of container b) Size of the container c) Whether the contain has a cover	Type of Domestic Water Storage Container	Number of Containers	Size of containers (litres)	Cover
	Ceramic pot			Yes ☐ No ☐
	Plastic			Yes ☐ No ☐
	Metal			Yes ☐ No ☐
	Other.			Yes ☐ No ☐
	TOTAL DRINKING WATER STORAGE CAPACITY		Litres	

Qu16 Ask the respondent **how often they usually clean** their **household drinking water container**	Frequency of Cleaning	Tick 1 ONY
	Each time it is filled	☐
	Once a day	☐
	Once every 2 days	☐
	Twice a week	☐
	Once a week	☐
	Less than once a week	☐

Qu17 Ask the respondent **what they usually use to clean** their household drinking water container	CLEANING MATERIALS	Tick ONLY 1
	Water ONLY	☐
	Water & soap & (cloth or brush)	☐
	Water & cloth ONLY	☐
	Water & brush ONLY	☐
	Other (specify)	☐

Severe Diarrhoea Status

[Severe diarrhoea is classified as at least 3 watery stools in one day]

Qu18 How often do HH members suffer from diarrhoea at this time of the year?	Household Members	Frequency of Diarrhoea	NO FAMILY MEMBER
	Elderly (over 65 years)	Often ☐ Sometimes ☐ Rarely ☐	☐
	Adults (18-65 years)	Often ☐ Sometimes ☐ Rarely ☐	☐
	Children (5-18 years)	Often ☐ Sometimes ☐ Rarely ☐	☐
	Children (under 5 years)	Often ☐ Sometimes ☐ Rarely ☐	☐

Qu19 Has anyone in your family suffered from severe diarrhoea in the past 2 weeks?	Household Members	Number of people suffering from severe diarrhoea in the past 2 weeks	NO FAMILY MEMBER
	Elderly (over 65 years)		☐
	Adults (18-65 years)		☐
	Children (5-18 years)		☐
	Children (under 5 years)		☐

Qu20 Ask the respondent about what **treatment** they usually give to household members suffering from **severe diarrhoea** ? **PROBE …** Do **not** give examples or suggestions from the list, but encourage the respondent to think of more than 1 response	Can tick more than 1
Don't know	☐
Nothing	☐
Serum drip	☐
Syringe injection	☐
Buy pills	☐
Make traditional remedy (plant leaves, tree bark, animal parts) **please name …**	☐
Give **extra** water to drink	☐
Give extra **clean** water to drink	☐
Give **less** water to drink	☐
Give **less** food to eat	☐
Give Oral Rehydration Solution (ORS packet from a pharmacy)	☐
Give mixture of coconut water, salt and sugar (home-made ORS)	☐
Give rice soup / rice water	☐
Give fruit juice or milk & sugar	☐
...	☐

Annex 02: DAILY RECORD of WATER DELIVERIES to 5 TARGET HOUSEHOLDS

To be completed by Oxfam Technicians daily using data from **Annex 03 – Water Vendors Monitoring Form**

Water Vendor		Source	Dedaye Pond	Date/Day	M T W Th F S S ___ / __ / 2011 DAY __

HYDROGEN PEROXIDE	Type of H_2O_2	Concentration	Dosing Volume for 50 gallons
	Myanmar ☐ Sanosil D10 ☑	2.5 %	____ ml

Water sample for testing by Oxfam's water quality technician

WATER SAMPLE	Sampling Time		Time Delivered to Oxfam	
	Processing Time *		Av. E-Coli per 100ml *	

- To be completed by Oxfam water quality technician

NOTE: When recording the volume of water delivered, please only use EITHER '*buckets*' OR '*gallons*' Do NOT count the same volume of water in two different ways

House Code	H 1	Head of Household	U Thein Win	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

House Code	H 2	Head of Household	U Zaw Tun	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	70				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	70				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

House Code	H 3	Head of Household	Daw Than Than Aye	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

House Code	H 4	Head of Household	Daw Khin Than	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

House Code	H 5	Head of Household	U Zaw Moe Latt	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

SUMMARY OF DAILY DELIVERY

Date / Day	M T W Th F Sat Sun *(circle)* ___ / ___ / 2011	DAY	

House	House Code	Time of Delivery	Number of Containers Filled or Partially Filled	Volume Delivery	
				Buckets	Gallons
House 1	H1				
House 2	H2				
House 3	H3				
House 4	H4				
House 5	H5				
			TOTAL VOLUME DELIVERED		

Physical Parameters

Taste	Intensity ☐	Nature ☐
Odour / Smell	Intensity ☐	Nature ☐
Colour	Intensity ☐	Nature ☐

Bacteriological contamination	**E-Coli per 100ml**	cfu/100ml

Annex 03: WATER VENDORS DAILY MONITORING FORM

Water Vendor		Source	Dedaye Pond	Date/Day	M T W Th F S S ___ / __ / 2011 DAY __

Water sample for testing by Oxfam's water quality technician

WATER SAMPLE	Sampling Time		Time Delivered to Oxfam	

House Code	H 1	Head of Household	U Thein Win	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

House Code	H 2	Head of Household	U Zaw Tun	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	70				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	70				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

House Code	H 3	Head of Household	Daw Than Than Aye	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

House Code	H 4	Head of Household	Daw Khin Than	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

House Code	H 5	Head of Household	U Zaw Moe Latt	Time of Delivery	

Container #	Type *[ceramic / concrete / plastic / metal]*	Size (gallons)	Volume Before Delivery	Volume Delivered		Covered
				Buckets	Gallons	
Jar 1	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
Jar 2	Ceramic	50				Fully ☐ Partially ☐ Uncovered ☐
			TOTAL			

Oxfam

A TRANSFER OF WATER TO THE DRINKING WATER CONTAINER

Please complete the following table EVERY time water is transferred from the domestic water storage container to the drinking water container

Date	Time of Transfer	Storage container	Utensil used to transfer water	Volume Transferred (EITHER count the containers Or estimate the volume)
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	
		1 ☐ 2 ☐	Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐ Other ……………...	

Annex 05: HOUSEHOLD SAMPLING SHEET FOR DAILY TESTING

Oxfam

Date / Day	M T W Th F ___ / ___ / 2011 DAY ____	Technician	
Head of Household		House Code	H ___

Sample taken from the DOMESTIC WATER STORAGE CONTAINER 1

Time of Sampling		Sample code	D ___H ___ S1

Observation :

Container Number		Size	gallons	Turbidity	NTU
Is the container covered?	Fully Covered ☐	Partially Covered ☐	Uncovered ☐		
How much water is in the container at sampling time?	¼ full ☐	½ full ☐	¾ full ☐	full ☐	or ____ gallons

Other relevant comment / observations which may affect water quality …..

Ask the respondent :

When was the last delivery of water for this container?	_____ hours / days (circle) ago
How is water removed from the container?	Scoop with handle ☐ Scoop WITHOUT handle ☐ Bucket ☐

Completed at Oxfam Office

Physical Parameters			Taste	Intensity ☐	Nature ☐
Colour	Intensity ☐	Nature ☐	Odour / Smell	Intensity ☐	Nature ☐

Time of Processing		Residual H_2O_2	mg/lit	E-Coli count	cfu/100ml

Sample taken from the DOMESTIC WATER STORAGE CONTAINER 2

Time of Sampling		Sample code	D ___H ___ S2

Observation :

Container Number		Size	gallons	Turbidity	NTU
Is the container covered?	Fully Covered ☐	Partially Covered ☐	Uncovered ☐		
How much water is in the container at sampling time?	¼ full ☐	½ full ☐	¾ full ☐	full ☐	or ____ gallons

Other relevant comment / observations which may affect water quality …..

Ask the respondent :

When was the last delivery of water for this container?	_____ hours / days (circle) ago
How is water removed from the container?	Scoop with handle ☐ Scoop WITHOUT handle ☐ Bucket ☐

Completed at Oxfam Office

Physical Parameters			Taste	Intensity ☐	Nature ☐
Colour	Intensity ☐	Nature ☐	Odour / Smell	Intensity ☐	Nature ☐

Time of Processing		Residual H_2O_2	mg/lit	E-Coli count	cfu/100ml

Sample taken from the HOUSEHOLD DRINKING WATER CONTAINER

Time of Sampling		Sample code	D ___H ___ D

Observation :

Type of container	Ceramic ☐ Metal ☐ Plastic ☐ Other (specify) ☐ ……
Is the container fully covered at the time of sampling?	Fully covered ☐ Partially covered ☐ Uncovered ☐

Other relevant comment / observations which may affect water quality …..

Ask the respondent :

When was the drinking water transferred from the storage container ?	……. hours / days (***circle***) ago
How long was the water in the storage container before transfer to this container ?	……. hours / days (***circle***)
How was the water transferred ?	Scoop WITH handle ☐ Scoop WITHOUT handle ☐ Bucket ☐
Did the HH do anything to improve this water ?	Nothing ☐ Strain through cloth ☐ Boil water ☐ Alum ☐
How does the HH remove water for drinking ?	Scoop with handle ☐ cup ☐ tap ☐ Other ……

Completed at Oxfam Office

Physical Parameters			**Taste**	Intensity ☐	Nature ☐
Colour	Intensity ☐	Nature ☐	**Odour / Smell**	Intensity ☐	Nature ☐

Time of Processing		**Residual H_2O_2**	mg/lit	**E-Coli count**	cfu/100ml

Health Status of Beneficiaries

Qu01 Does any household member currently have diarrhoea?	Yes ☐ **Go to Qu02** No ☐ **End of Section**

For HH with someone suffering from diarrhoea,	**People living in the household**	**Female**	**Male**	**Total**
	TOTAL			
Qu02 Who in your household has diarrhoea ? *[Write the number of people suffering from diarrhoea in the appropriate boxes]*	Elderly (over 65 years)			
	Adults (18-65 years)			
	Children (5-18 years)			
	Children (under 5 years)			

Qu03 How many days have they been suffering with diarrhoea ?	…… days
Qu04 Is this person drinking water treated with H_2O_2 ?	Yes ☐ **Go to Qu05** No ☐ **Go to Qu06**
Qu05 Is this the <u>ONLY</u> water they are drinking ?	Yes ☐ **Go to Qu06** No ☐ **Go to Qu06**
Qu06 What is the household doing to treat this person ?	

Annex 06: MONITORING FORM FOR THE CLEANING OF CONTAINERS AND UTENSILS

To be completed by Oxfam Technicians when collecting water samples **DAY ___ DATE: __ / __ / 2011**

Drinking Water Container

House	Container cleaned since last visit	Number of times cleaned	Cleaning Method Can tick more than 1 box
1	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)
2	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)
3	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)
4	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)
5	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)

Domestic Water Container [50-gallon jar]

House	Container cleaned since last visit	Number of times cleaned	Cleaning Method Can tick more than 1 box
1	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)
2	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)
3	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)
4	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)
5	Yes ☐ No ☐		Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐ other (specify)

Transfer Utensil

House	Container cleaned since last visit	Number of times cleaned	Transfer Utensil	Cleaning Method Can tick more than 1 box
1	Yes ☐ No ☐		Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐	Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐
2	Yes ☐ No ☐		Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐	Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐
3	Yes ☐ No ☐		Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐	Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐
4	Yes ☐ No ☐		Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐	Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐
5	Yes ☐ No ☐		Bucket ☐ Scoop WITHOUT handle ☐ Scoop WITH handle ☐	Water ONLY ☐ Soap ☐ Brush ☐ Cloth ☐

Annex 07: Bacteriological Testing – Data Processing Form

TECHNICIAN		DATE		TEST DAY	

Sample Code	Source Water	Sampling Point	House	Head of Household	Turbidity (NTU)	Volume Filtered (ml)	Time Filtered	Petri Dish No.	Total Colonies counted	Colonies per 100ml	Residual H_2O_2 [mg/l]
D_ H1 S1	Dedaye pond	Storage container 1	House 1			100ml			-		
D_ H1 S2	Dedaye pond	Storage container 2	House 1			100ml					
D_ H1 D	Dedaye pond	Drinking water container	House 1			100ml			-		
D_ H2 S1	Dedaye pond	Storage container 1	House 2			100ml			-		
D_ H2 S2	Dedaye pond	Storage container 2	House 2			100ml					
D_ H2 D	Dedaye pond	Drinking water container	House 2			100ml			-		
D_ H3 S1	Dedaye pond	Storage container 1	House 3			100ml			-		
D_ H3 S2	Dedaye pond	Storage container 2	House 3			100ml					
D_ H3 D	Dedaye pond	Drinking water container	House 3			100ml			-		
D_ H4 S1	Dedaye pond	Storage container 1	House 4			100ml			-		
D_ H4 S2	Dedaye pond	Storage container 2	House 4			100ml					
D_ H4 D	Dedaye pond	Drinking water container	House 4			100ml			-		
D_ H5 S1	Dedaye pond	Storage container 1	House 5			100ml			-		
D_ H5 S2	Dedaye pond	Storage container 2	House 5			100ml					
D_ H5 D	Dedaye pond	Drinking water container	House 5			100ml			-		
D__P1	Dedaye pond	Untreated source water	-			50ml					
D__P2	Dedaye pond	Untreated source water	-			50ml					

Date incubated	___ / ___ / 11	Time Incubated		Date Removed	___ / ___ / 11	Time Removed		Hours Incubated	hours

Annex 08: Schedule of the Study

A Daily Schedule

Mon	Tue	Wed	Thur	Fri	Sat	Sun
			10 March **Training for Oxfam Technicians**	11 March **Meeting – vendor & HH**	12 March **1st Delivery**	13 March **Delivery**
14 March **Delivery** **TESTING**	15 March **Delivery** **TESTING**	16 March **Delivery** **TESTING**	17 March **Delivery** **TESTING**	18 March **Delivery** **TESTING**	19 March **Delivery**	20 March **Delivery**
21 March **Delivery** **TESTING**	22 March **Delivery** **TESTING**	23 March **Delivery** **TESTING**	24 March **Delivery** **TESTING**	25 March **Delivery** **TESTING**	26 March **Delivery**	27 March **Delivery**
28 March **Delivery** **TESTING**	29 March **Delivery** **TESTING**	30 March **Delivery** **TESTING**	31 March **Delivery** **TESTING**	1 April **Delivery** **TESTING**	2 April **Delivery**	3 April **Delivery**
4 April **Delivery** **TESTING**	5 April **Delivery** **TESTING**	6 April **Delivery** **TESTING**	7 April **Delivery** **TESTING**	8 April **Delivery** **TESTING**		

B Details of Daily Tasks

Time	Water Vendor	Oxfam's Water Quality Technician
Morning	▪ Deliver treated water to 5 target households ▪ Keep records of each delivery ▪ Collect 1-litre water sample from pond source ▪ Deliver daily delivery record and water sample to Oxfam office	▪ Prepare 18 Petri-dishes for bacteriological testing. ▪ Record bacteriological testing results from previous day. ▪ Update delivery records and sampling sheets from the previous day ▪ Receive daily delivery record from vendor ▪ Update excel database ▪ Ensure water source sample from vendor is refrigerated
Afternoon		▪ Take 2 water samples from each of the 5 target households (including turbidity tests on site) ▪ Make a record of household water transfers and cleaning of containers and utensils ▪ Conduct H_2O_2 residual tests ▪ Conduct bacteriological testing ▪ Update excel database ▪ Ensure all monitoring forms are correctly filed

Annex 09: Coding System for the Physical Water Testing Parameters of Taste, Odour & Colour

TASTE

Qualitative Taste - Intensity	
1	No taste
2	Very slight
3	Slight
4	Strong
5	Very Strong

Qualitative Taste - Nature	
0	None
1	Bitter
2	Chemical
3	Decayed vegetables
4	Earthy
5	Fishy
6	Flat
7	Metallic
8	Mouldy
9	Musty
10	Oily
11	Sour
12	Sweet
13	Other (specify)

ODOUR (SMELL)

Qualitative Odour - Intensity	
1	No smell
2	Very mild
3	Mild
4	Strong
5	Very strong

Qualitative Odour - Nature	
0	None
1	Earthy
2	Musty
3	Oily
4	Sewage
5	Woody
6	Soapy
7	Milky
8	Fruity
9	Sweet
10	Disinfectant
11	Polish / cleaning fluid
12	Gas
13	Other (specify)

COLOUR

Qualitative Colour - Intensity	
1	No colour
2	Very slight
3	Slight
4	Strong
5	Very Strong

Qualitative Colour - Nature	
0	None
1	Blue
2	Green
3	Milky white
4	Brown
5	Red
6	Other (specify)