Project Report for Pure Home Water, Ghana

Sophie Johnson

Teshamulwa Okioga

Independent Study, MIT Sloan School

Advisor: Simon Johnson

February 21, 2007

Executive Summary

This paper outlines the activities that Sophie Johnson and Teshamulwa Okioga conducted as part of an independent study through the MIT Sloan School under Professor Simon Johnson. The independent study was similar to other Global Entrepreneurship (G-Lab) projects.

Sophie Johnson evaluated Pure Home Water's ceramic filter program through household surveys and water quality testing. Overall, she found that the new rural marketing strategy is reaching those who need the filters most and that the filters are significantly improving water quality. Teshamulwa Okioga analyzed the feasibility of marketing Pure Home Water's ceramic filter to sachet water vendors in Tamale. She found that the filter would only be feasible for small scale hand-tied sachet-water production.

All figures are included in the appendix.

Acknowledgements

Special thanks go to G-Lab for financing this independent study and for giving us the opportunity to attend lectures in the course. We especially thank Prof. Simon Johnson and Susan Murcott for their supervision and input towards the study, and the PHW team: Hamdiyah Alhassan, Wahabu Salifu, Elizabeth Wood, Shaquru, Iman Yazdani, and Alioune Dia, and World Vision for their support while in Ghana.

TABLE OF CONTENTS

1 BACKGROUND

1.1 Ghana Background

Ghana is located in West Africa (Figure 1) and has a total area of about 240,000km^2 and a population of approximately 22.5 million. The climate is tropical in the south near the coast and semi-arid towards the north. Although the official language of Ghana is English, several other local languages are spoken. 63% of the population is Christian, 16% are Muslim (mostly in the Northern region) and 23% follow traditional indigenous beliefs (CIA 2006).

The current environmental concerns in Ghana include soil erosion due to deforestation and overgrazing, recurring drought in the north which affects farming, and inadequate supplies of potable water (CIA 2006).

The major diseases prevalent in Ghana are malaria, yellow fever, schistosomiasis (bilharzias), typhoid, and diarrhea. Diarrhea is of particular concern since this has been identified as the second most common disease treated at clinics and one of the major contributors to infant mortality (Mattelet 2006), which currently stands at about 55 deaths per 1,000 live births (CIA 2006). The major cause of diarrheal disease is lack of adequate sanitation and safe drinking water. After Sudan, Ghana has the highest incidence of Dracunculiasis (Guinea worm disease) in the world. 75% of these cases have been reported in Ghana's Northern Region (WHO 2006).

1.2 Pure Home Water

Pure Home Water (PHW) is a social business established in Ghana to promote household drinking water and safe storage (HWTS) products to low-income customers in

the Northern Region of Ghana. It is the first social business of its kind in Ghana that aims at giving users options to affordable and locally manufactured HWTS products through door-to-door sales, community schools and hospital outreach, and retail sales.

Through funding from the Conrad N. Hilton Foundation, the PHW project was initiated in August 2005 in Tamale, one of the poorest cites in Ghana. The Conrad N. Hilton Foundation provided a start-up fund for two years from 2005 to 2007, amounting to a total budget of US$ 150,000. The project's original goal was to be self sustaining by sale of HWTS within this period, but we now know that PHW will not achieve this goal in that timeframe.

PHW is managed by Elizabeth Wood, a recent Harvard graduate, and two Ghanaian social entrepreneurs, namely Hamdiyah Alhassan, a civil and environmental engineer, and Wahabu Salifu, a development planner. The principle investigator for the project is Susan Murcott, a Senior Lecturer in the Department of Civil and Environmental Engineering at MIT. PHW is also working in close collaboration with World Vision and students from MIT, Harvard and Brandeis Universities, who provide support through research, development, monitoring, and evaluation studies.

1.3 The Products and Business Model of Pure Home Water[1]

The goal of PHW is to provide "safe water to people in Northern Ghana in order to reduce or eliminate water-related diseases". The project's objectives are as follows:

[1] Information in this section is based on a Powerpoint presentation created by Elizabeth Wood in January 2007 for Pure Home Water.

- To verifiably improve water at the point-of-use by widely disseminating HWTS products in households, schools, hospitals and among leaders in targeted districts in Northern Ghana
- To create a sustainable market for HWTS through awareness-raising and education
- To establish a ceramic water filter factory and testing facility in the Northern Region of Ghana by December 2007

The initial strategy of PHW was based on marketing a large range of locally manufactured and affordable HWTS products, with the objective of giving consumers a range of options to choose from. The products consisted of solar disinfection (SODIS) systems, the modified clay pot, plastic safe storage vessels, biosand filters, Nnsupa candle filters and the Ceramica Tamakloe Filtron (CT Filtron) filter. Due to limited capacity and resources of its several person staff in Ghana, PHW narrowed down from a range of products to focus on promoting only the ceramic pot filter (the CT Filtron), the modified safe storage clay pot and a plastic safe storage container. The product selection was based on recommendations from the 2006 G-Lab team and on performance and treatment efficiency evaluations undertaken by MIT engineering students and PHW staff.

PHW further narrowed its focus to concentrate on marketing the ceramic pot filter with the goal of setting up a filter factory and a water testing facility, where the performance of the filters produced would be assessed. The ceramic pot filter was selected as the main product due to the following factors:

- Proven user acceptability

- Possibility of local production
- Low cost treatment over the life of filter
- High treatment efficiency and performance
- "One-step" treatment and safe storage
- Cultural compatibility with traditional ceramic clay storage vessels
- Ability to treat water of very high turbidity as is common in Northern Ghana

The main problems identified with the ceramic pot filter included its relatively high initial price, filter brakeage during transportation, slow filtration rate of approximately 2.5 liters per hour, high dependence on maintenance, which affects the filtration rate and treatment efficiency, and the low levels of awareness of the technology.

During 2005-2006 year, PHW had set the CT filtron price at US$19 (GHC 170,000)[2] when bought in cash and US$ 20 (GHC 180,000) when bought on credit. The price of the filtering element was set at US$ 6.10 (GHC 55,000). However, according to surveys conducted by Peletz (2006), the willingness-to-pay for filter technologies was between US$ 8.00 (GHC 72,000) and US$ 8.90 (GHC 80,000). PHW thus realized that the ceramic pot filter would not reach the poor as it was unaffordable to many.

In August 2006 a two member Harvard-MIT Sloan Leader in Manufacturing team conducted a one-month assessment of PHW's first year and recommended major revisions to its pricing, marketing, and promotion strategy. Towards the end of the year 2006, PHW implemented this Year 2 Strategy, which included new outreach initiatives

[2] The exchange rate used is US$1 = GHC 9,000.

that especially targeted the poor. Two prices were set for the filter: a "retail price" for urban areas and a "subsidy price" for rural areas. PHW describes the retail price as a discounted price of approximately US$ 10 to US$ 15 that would generate profit if the filters were manufactured locally by PHW. The subsidy price was set at approximately US$ 6 to ideally reach rural villages and the urban poor. The subsidy price was considered as a partial grant to target those who needed the filter most.

The Year 2 Strategy was categorized into three main areas based on the marketing approach and the target population, as follows:

1. Urban Outreach

In this outreach approach, business owners referred to as retailers, located at urban centers, are approached to sell filters for a commission and at the "retail" price. The filters can be purchased by the retailers in installments, with the first installment being at least half the filter price and the remaining paid once the filters are sold. The retailers are trained on how to use and clean the filters, so that they can demonstrate to potential customers. They are also provided with promotional materials which include posters and pamphlets.

2. Hospital Outreach

This outreach program is similar to the urban outreach in that filters are sold to individuals who re-sell them at the "retail" price and receive commission on sales made. In the hospital outreach program, the liaisons are primarily nurses who market the filters

to patients that visit the hospital. In this program, free filters are also provided for each ward for the purpose of demonstration and use in the hospital. The nurses identified as retailers are responsible for cleaning and maintaining the free filters at the hospital on a voluntary basis.

3. School Outreach

In this outreach approach, the PHW team works in collaboration with the Ghana Educational Services to reach out to schools. Identified teachers act as liaisons and give demonstration to both school children and their fellow teachers on the use of the ceramic pot filter. The school children are asked to share information on the filter with their parents and members of their households. Like in the Hospital Outreach Program, free filters are given out to each class for use and demonstrations and maintained by the school liaisons.

4. Rural Outreach

This is a community level outreach approach, which involves identifying and training key opinion leaders such as chiefs, community elders and other respected members of the rural society on use of the ceramic pot filter and providing them with free filters. The opinion leaders are expected to open their homes to their communities, show the filter in use and allow visitors to taste and sample filtered water. Since the leaders are respected members of the society, it is expected that other members of the community will more readily consider what has already been accepted by the leader and become interested in purchasing a filter for their own family.

In the rural outreach, PHW also works with community liaisons who are generally responsible for reaching out to members of their communities by holding demonstration meetings, presentations, and training sessions on use of the ceramic pot filter, distributing the filters to opinion leaders and selling them at the "subsidized" price to other members of the rural communities. The liaisons earn a commission on filters sold at the "subsidized" price. The community liaisons also act as a link between the rural communities and PHW, in that they obtain user feedback information on the filter and answer questions posed by the communities.

Part PHW's Year 2 Strategy is to manufacture its own ceramic filters in the Northern Region by December 2007, so as to be able reduce the costs incurred in disseminating the filters and enable the production and distribution and/or sale of filters to be self sustaining. The local manufacturing option is also expected to enhance quality control of the filter production. Other plans for the Year 2 Strategy include acquiring a vehicle to transport filters for distribution and sale and potentially to open retail shops for the ceramic filters and related products.

2 Ceramic Filters Program Evaluation

Rigorous monitoring and evaluation is essential for ascertaining whether project goals are being met and for reporting to donors. This aspect of the MIT team project assessed Pure Home Water's ceramic filter project, with particular focus on their new rural outreach program.

A total of 41 households were surveyed, including 25 ceramic pot filter users and 16 non-filter users. Six of the filter users were from modern communities, while the rest

of the respondents were from traditional communities[3]. The six users from modern communities were interviewed last year by Rachel Peletz (2006), and they were revisited for follow-up this year. The complete survey undertaken in each of the two years is appended. If respondents were filter users, questions were asked about why the technology was selected, how acceptable it is, and how it is maintained and operated. Non-users were asked about their willingness to purchase a ceramic water filter and how they found out about the technology, if applicable. All respondents were asked about general household information; diarrhea knowledge and incidence; household hygiene and sanitation; and water use practices and perceptions.

In addition to household surveys, water quality tests were conducted on samples collected from each household. Respondents without ceramic filters were asked for a drinking water sample, and those with filters were asked for both an unfiltered and filtered water sample. The unfiltered water came from inside the ceramic element when possible, representing the water that had not yet passed through the filter. Unfiltered samples and filtered samples were analyzed for *E. coli*, total coliform, hydrogen sulfide bacteria, and turbidity.

Although the data from the household surveys and the water quality tests will be analyzed further for Sophie Johnson's Master of Engineering thesis, many of the responses applicable to PHW are summarized below within the four P's framework.

[3] For the purpose of this report, Peletz's (2006) convention is used to define a modern community as one with concrete homes and a traditional community as one with mud homes arranged in circles. Traditional communities typically use firewood and charcoal for energy, while the modern communities usually have electricity at least for part of the day.

2.1 Product

PHW's primary product, the pot-shaped Ceramica Tamakloe ceramic water filter, was evaluated through the household surveys and water quality tests described above. Overall, filter owners seemed to be very satisfied with the product. All households (25/25) said that the filter is used 7 days a week. Also, 88% (22/25) claimed that they treat all the water that the family uses for drinking. Three out of 25 families do not treat all water because sometimes untreated water is more convenient, and sometimes the filter does not provide enough water for all family members. It is probable that more people drink unfiltered water since family members at several households were seen drinking from vessels containing unfiltered water.

Several questions were asked about how acceptable the ceramic filter is to the users. One hundred percent of users (25/25) said that they are happy with the technology, that it is easy to use, and that they would recommend it to others. One respondent had recommended the filter to 3-4 people who then bought the product for their households. All respondents (25/25) said they would replace their filter if it broke. Some problems were cited, including a few broken spigots in the filters in use for over one year, slow flow rates, and one broken receptacle. It is recommended that PHW give families an option to pay more for a metal spigot instead of the plastic spigot that is provided. Although the metal spigots do not turn off automatically and are more expensive, they are much more durable. Also, many households needed the brush that is supposed to come free with a filter purchase. Respondents with turbid water reported cleaning their filter several times each week, while others said they clean it a couple times each month as necessary. Because households are typically large in this region, PHW may suggest that

families buy multiple units if possible. Traditional households averaged 12.5 members, and modern households averaged 6 members. One family interviewed had two filters, and it is likely that many of the families could better meet their needs with a second filter.

In addition to the user surveys, the water quality tests also showed that most ceramic filters seem to be performing well in the field. Although extensive analysis will be done in a later report, a graph of the H_2S presence/absence results for the filtered and unfiltered water is included in Figure 2. It shows that 94% (32/34) of the unfiltered samples test positive for hydrogen sulfide bacteria, while only 22% (6/27) of the filtered water samples test positive. Additionally, Figure 3 shows total coliform bacteria counts for unfiltered and filtered water. In most cases, filtered water had 99.9% fewer total coliform bacteria than unfiltered water.

2.2 Price

As described previously, PHW has changed its pricing scheme. The subsidized price seems to be within reach of most people in the rural areas. Filter users were asked what they would pay to replace their filter if it broke, and most said that they would pay the price at which they purchased it, or US$ 6.70 (GHC 60,000). The average response was US$ 7.60 (GHC 68,000), and the median was US$ 6.70 (GHC 60,000). Filter users were asked if their neighbors would buy one at the price they gave in the previous answer, and 84% (21/25) said “yes.” Non-users were also asked what they would pay for a ceramic filter unit, and their average response was a little lower at US$ 4.30 (GHC 39,000). Figure 4 shows the willingness to pay for ceramic filters for both non-users and users.

2.3 Place

Place is analyzed in two respects, both the target communities PHW is reaching and the marketing channels by which they are doing so.

The household surveys determined that PHW is reaching people in greatest need for the ceramic filters. Whereas PHW's Year 1 strategy mostly reached people from modern communities in the urban areas and outskirts of the Northern district capital of Tamale that have access to improved water and sanitation[4], Year 2's strategy has made it possible to reach poorer people in rural communities. Zero percent (19/19) of the filter users from the rural communities have year-round access to an improved water supply or improved sanitation, and only one of the rural filter users had attended school.

The marketing channels also seem effective. Community liaisons in each village are accessible for people who want to buy filters or who have questions about them. However, there are many people who want to buy filters, and there have been delays from the factory in Accra. Hopefully PHW's asumming a new role in manufacturing will prevent these delays from occurring in the not so distant future.

2.4 Promotion

The rural promotion efforts seem to be reaching many people in each village. 93% (14/15) of non-users were aware of the ceramic filters in their village, and one third of the non-users (5/15) had had water from a filter. Many noted that the filtered water tasted very good and was clear. All fifteen non-users expressed an interest in treating

[4] Improved water sources include household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collection. The source must be less than one kilometer from the user's home. Improved sanitation sources include connection to a public sewer, connection to a septic system, pour-flush latrines, simple-pit latrines, and ventilated-improved pit latrines. The facilities must be private and must separate human excreta from human contact (JMP 2005).

their water. A question was added later about whether or not the respondent had attended the Pure Home Water village presentation, and the results are shown in Figure 5. The numbers indicate that presentation attendance might encourage people to buy the filters.

3 Sachet-vended Water Evaluation

In addition to the monitoring and evaluation, it is also important to conduct research aimed at exploring new avenues in PHW's marketing approach. This aspect of the project assessed possibilities of targeting sachet water vendors as future potential customers for PHW products.

Water Vendors are "small or medium scale entrepreneurs who have made water distribution their main source of income and who generally invest their own capital to initiate their services" (Conan, 2003). Ghana has small to large-scale water vendors that pack and machine-seal sachet water (bagged water) in factories. This is locally referred to as "pure water". The factory-produced sachet water is treated via a point-of-entry system, then filled and bagged by machine. Sachet water is also sold in polythene bags that are filled with water and tied by hand. The hand-tied sachet water is locally known as "ice-water." The sachets hold approximately 500 and 700ml of water respectively.

Based on the success of the sachet water industry in Ghana, this aspect of the project identified key marketing strategies successfully used by sachet water vendors, in terms of the 4 P's, specifically noting those that can be applied by PHW in promoting their HWTS products. In addition to this, the study assessed the feasibility of promoting PHW products to sachet-water vendors. As part of the MIT Masters of Engineering component of the project, the methodology involved conducting water quality tests on both factory-produced and hand-tied sachet water to determine the microbial quality of

water and to assess if there was need for PHWs interventions in improving the quality. The water quality tests showed higher percentages of microbial contamination (86% higher) in hand-tied sachet water and thus greater need for improvement for those vendors. Results for the tests are graphed in Figure 6.

The project work involved interviewing 30 customers/buyers of sachet water, 10 road-side sachet-water vendors and 10 sachet-water producers. While structured interviews were conducted on the customers and road-side vendors, the interviews given to the producers were less structured and mainly conducted for the purpose of understanding the industry and process of sachet-water production. The semi-structured interviews with the sachet-water producers therefore followed a fairly open framework which allowed for a two-way interaction with the individuals interviewed. Five of the producers interviewed were those who produced hand-tied sachet water, while the remaining 5 produced sachet water in factories. The producers were interviewed at the production premises where they also demonstrated how they packaged their water. Since the responses largely varied, the specific responses are not included in this report, but rather discussed in general.

The road-side vendors included retailers of factory-produced sachet water, vendors of hand-tied sachet, as well as those who sold both in Tamale. The vendors were interviewed to obtain information that included the cost of sachet water, the brands and types they sold, the places the vendors sold the water and reasons for choosing the respective areas. This information was considered useful to PHW in determining where to set up the intended retail shops.

Information regarding the main customers targeted by the vendors, the average amount sold per day and the income generated was also obtained. Vendors that sold hand-tied water were asked whether or not they treated their water and how much they were willing to invest in implementing or improving water treatment systems for their products. This information was used to determine if the sachet water vendors would feasibly be included in the outreach programs.

Through the customer surveys, information that included the type of sachet water bought (hand-tied or factory-produced) and the amount bought per day was obtained. Other information included the customers' perceptions on price, quality of sachet water and quality of service offered by sachet water vendors. Their responses were used to determine the characteristics of service the customers appreciated most. A comparison of how much water people drank in their homes and away from home was also obtained from the survey results. This was done to assess the impact of promotion of HWTS in areas away from "home".

3.1 Factory-Produced Sachet Water

All the factory-produced sachet water was treated by a point-of-entry system that made use of filtration and ultra violet (UV) disinfection. The production varied from approximately 15,000 sachets per day during the rainy and cold seasons to approximately twice as much during the dry and hot seasons.

All the sachet-water factories visited sold sachet-water only in bulk, to retailers and consumers, whereby individual sachets of water were packed in larger bags that contained 20, 25 or 30 sachets. The main buyers were retailers and included gas stations, shops, mini-markets, and distribution trucks. The cost per bulk bag of 20 to 30 sachets

ranged from between US$ 0.50 to 0.56 (GHC 4500 to 5000). The individual sachets were sold by retailers for US$ 0.04-0.06 (GHC 400 to 500), indicating the retailers would ideally make more than 100% profit on their sales.

All the factories kept detailed records of sales including the number of sachets produced and sold, debtors, creditors and salaries paid. The records were updated daily. The sachet water sealing machines automatically printed, on the sachets, the batch number of bags produced thus making it easy to keep track of the production.

The marketing strategy used by the sachet-water factories includes giving out free samples, networking, radio advertisements, using promotional material such as T-shirts, and producing and distributing stands with the sachet water brand name and logo to retailers.

3.2 Hand-tied Sachet Water

Hand-tied sachet water was treated with a cloth filter or sponge, or simply not treated at all. The amount bagged by the producers varied from 30 to 200, depending on the capacity of the producers, and sold at US$ 0.02 (GHC 200) per sachet. None of the producers visited kept any records of the business. The main customers included passer-bys and business-owners around the areas they sold. The marketing strategies used by these vendors were mainly built on customer relations.

3.3 Customer Survey

This survey took a more structured approach. Detailed results are included in the Appendices. Several predetermined responses were included in the original questionnaires, but only options that had response frequencies greater than 1, meaning

those that were applicable to one or more interviewee, are presented in the results appended. From the survey we found that the customers selected the sachet water based on the quality and taste, packaging, cost, product name, reputation in market and convenience in reaching the vendors. All the interviewees felt that the quality of service of sachet water vendors was always good (70%) or usually good (30%).

While all the interviewees thought that the price of hand-tied sachet water was either cheap (23.3%) or affordable (76.7%), 33.3% felt that factory produced water was expensive. It was interesting to note that for 36.7% of the interviewees, sachet water formed the sole supply of drinking water, even at home! The same percentage used both sachet and tap water for drinking water in their homes. 70% of the respondents drank more water when away from home, 20% drank the same amount at home and away from home, while 10% drank more water at home.

3.4 Road-side Vendors Survey

All road side vendors interviewed were women and girls whose ages varied from less than 15 years to 40. There were no male sachet water vendors seen and therefore none were interviewed. 50% of the vendors sold their water specifically at Tamale's main taxi station, the market place and bus stops (OA and STC), 20% at the main taxi station and market place, 10% only at the market place, and another 10% around Tamale's main mosque area. 10% did not have a specific selling location.

70% of the respondents selected these areas as they had more customers (more people traffic) in the given locations. Half of the interviewees stated that taxi drivers were their main customers. All the vendors sold hand-tied sachet water at US$ 0.02 (GHC 200) and factory-produced sachet water at US$ 0.04 (GHC 400) and made

between US$ 1 to 5.5 (GHC 10,000 to 50,000) per day from sachets sold. Two of the sellers interviewed were the owners of the business, 7 were employed by family members (grandmother, mother etc) and 1 was employed by a non-member of her family. The vendors worked 2 to 12 hours a day and up to 7 days a week. Those employed earned between zero (60%) to US$ 0.6 (GHC 5000) per day (20%).

The source of water used was primarily tap water (either piped or from vendors and tankers) and this was treated by settling, filtration or a combination of both. A sponge or cloth was used in filtering. None of the vendors used safe storage containers although all but one washed their hands with soap. The vendors were willing to invest US$ 1 to 28 (GHC 10,000 to 250,000) on water treatment systems.

3.5 Feasibility of Marketing PHW Products to Sachet Water Vendors

PHW has in the past generally aimed at promoting HWTS products specifically for use in individual households, with the organization's goal being "to provide safe water to people in Northern Ghana in order to reduce or eliminate water related diseases". In the Year 2 Strategy, PHW has broadened its reach by targeting schools and hospitals in addition to individual households. While this may have resulted to the consumers having access to improved water in homes, schools and hospitals, a gap still remains in ensuring that people also have clean water when they are away from home or from school, and as they transit between their final destinations. Due to the hot day-time temperatures in Ghana, it was also not surprising to note that people consumed more water during the day, when they were away from home. Since this was the case, promoting safe water practices and safe water consumption in areas away from "home" would have a significantly great impact in providing clean water, especially to those that buy hand-tied

sachet water which we found to be microbially contaminated. From the surveys conducted, a total of 53.3% of the sample population drank hand-tied sachet water (including those who drank both hand-tied and factory-produced water), indicating that well over half the population might be at risk from drinking contaminated water.

Pure Home Water's ceramic pot filter and/or their safe storage container product with a spigot for drawing water hygienically were identified as viable options for treatment and safe storage for hand-tied, sachet water. However, with the given filter flow rate of 2 liters per hour, at least 5 filters (total cost of US$ 55.5 or GHC 499,500 using the urban retail price of US$ 11.1 per filter) would be required for the average production and sale of 100, 500ml sachets per day, with 5 hours set aside for packaging. The willingness to pay for water treatment systems was however up to US$ 28 (GHC 250,000), which would only cover the cost of two complete filter sets.

The high production capacity and relatively sophisticated treatment methods already applied by factory-produced sachet water industry clearly indicate that it would not be feasible to market any of the HWTS products of PHW to these producers. However a few lessons can be drawn from the vendors based on the marketing strategies applied as discussed in the section that follows.

3.6 4P's applied by Sachet-Water Vendors

Product: Here we consider the water quality, for both hand-tied and factory-produced sachet water, and the brand name and company reputation of factory-produced sachet water.

From interviews directed to customers of sachet-water, 80% felt that the water quality of factory produced sachet-water was good and only 33% felt the same for hand-

tied water. The fact that factory produced sachet water was generally considered to be "pure water" may have been a reason why 90% of the interviewees bought it despite it being more expensive when compared to hand-tied sachet water. Reasons for choosing specific sachet water brands included the quality of the physical product itself, convenient availability, the brand name and company reputation. 40% of the respondent preferred "Voltic" sachet-water which has been in the market for the longest time.

Price: Sachet water, being a cheaper alternative to bottled water, was purchased and drunk by all those interviewed and this was a good indication of the role price played.

Place: Only 10% of the customers surveyed walked more than 100m to buy sachet water, this pointing out that convenience in reaching vendors played an important part in sales. Road-side vendors particularly sold around taxi stations, where the majority of their customers (taxi drivers and/or passengers) were located.

Promotion: The promotional methods applied for factory-produced sachet water included radio commercials, free samples and promotional materials such as T-shirts. Hand-tied sachet water vendors mainly relied on building good customer relations to sell their products.

4 Conclusions and Recommendations

Overall, the evaluation of PHW's ceramic filter program indicated that the new approaches are working well. The household surveys showed that many new users lack access to improved water and sanitation, so the filters can greatly improve the quality of

their drinking water. Users are pleased with the ceramic filters' performance and ease of use, and water quality testing showed vast difference in unfiltered versus filtered water. Efforts should be made to provide more durable spigots and to reduce ceramic filter breakage. Although the subsidized price is helping PHW reach the poor, the organization will not be able to be self-sufficient in the near future. Potential new markets could be explored to help generate revenue.

PHW should consider marketing filters to individuals selling and producing hand-tied sachet water to close the gap in ensuring access to safe drinking water at all times and places. PHW should also consider creating awareness, through its outreach programs, to the producers, as once they realize the benefits, chances that they will accept the products will be much greater. While the relatively high microbial contamination in the hand-tied sachet water indicates a need for hardware measures that include water treatment, software measures such as awareness and training on the importance of simple hygienic behaviors is also strongly recommended. From the survey results, the ideal location for PHW's retail shops would include business premises around the taxi and bus stations, where the majority of the vendors made most of their sales. This location would also reduce the burden of having to carry purchased filters over long distances when using public transportation. Main streets of Tamale are also ideal locations. One of the most popular streets, according to the vendors, was one leading to Tamale's general post office. This street is also relatively close to the main taxi station.

5 References

Central Intelligence Agency (CIA). (2006, 3 November 2006). "CIA - The World Factbook - Ghana." <https://www.cia.gov/cia/publications/factbook/geos/gh.html>. Accessed 6 November 2006.

Conan, Hervé (2003b). The Role of Small Scale Private Water Providers in Serving the Poor. Asian Development Bank, Manila. ADB Website - http://www.adb.org/Water/Champions/paniagua.asp. Retrieved on 31 October 2006

Joint Monitoring Programme (JMP) for Water Supply and Sanitation (2006). UNICEF/WHO. <http://www.wssinfo.org/en/122_definitions.html>. Accessed 16 Feb. 2007.

Mattelet, C. "Household Ceramic Water Filter Evaluation Using Three Simple Low-Cost Methods: Membrane Filtration, 3M Petrifilm and Hydrogen Sulfide Bacteria in Northern Region, Ghana." Master of Engineer Thesis. Department of Civil and Environmental Engineering. Massachusetts Institute of Technology. June 2006.

Peletz., R. "Cross-Sectional Epidemiological Study on Water and Sanitation Practices in the Northern Region of Ghana." Master of Engineer Thesis. Department of Civil and Environmental Engineering. Massachusetts Institute of Technology. June 2006.

World Health Organization (WHO) (2006). "Dracunculiasis eradication." Weekly epidemiological record 81st year(18): 173-182.

6 Appendices

6.1 Figures

Figure 1: Map of Ghana (CIA 2006)

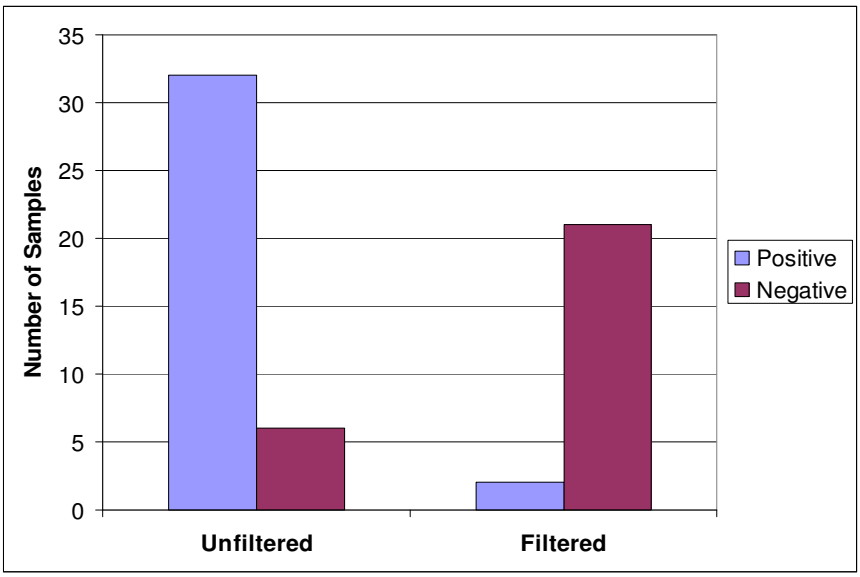

Figure 2: H_2S presence/absence test results for unfiltered and filtered water samples. A positive result indicate that H_2S producing bacteria were present in the water sample.

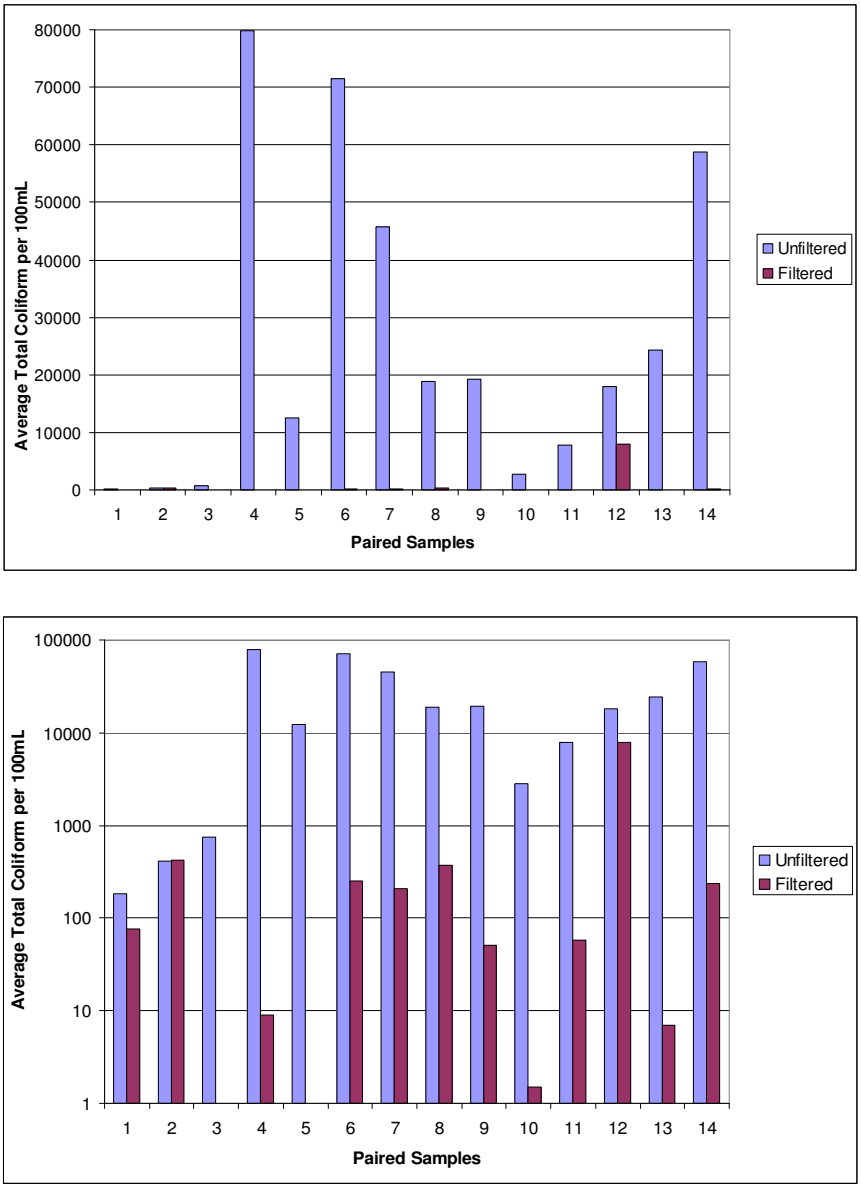

Figure 3: Total coliform counts for unfiltered and filtered samples using membrane filtration. The figures use the same data, but the bottom figure is on a log-scale so that filtered values can be seen.

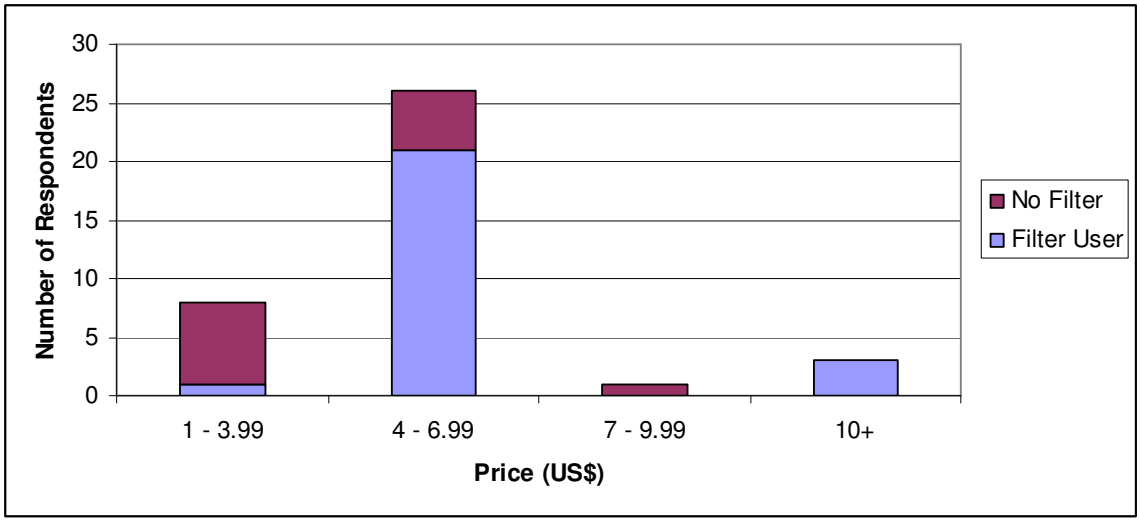

Figure 4: Willingness to pay for a ceramic water filter for households with and without a filter unit.

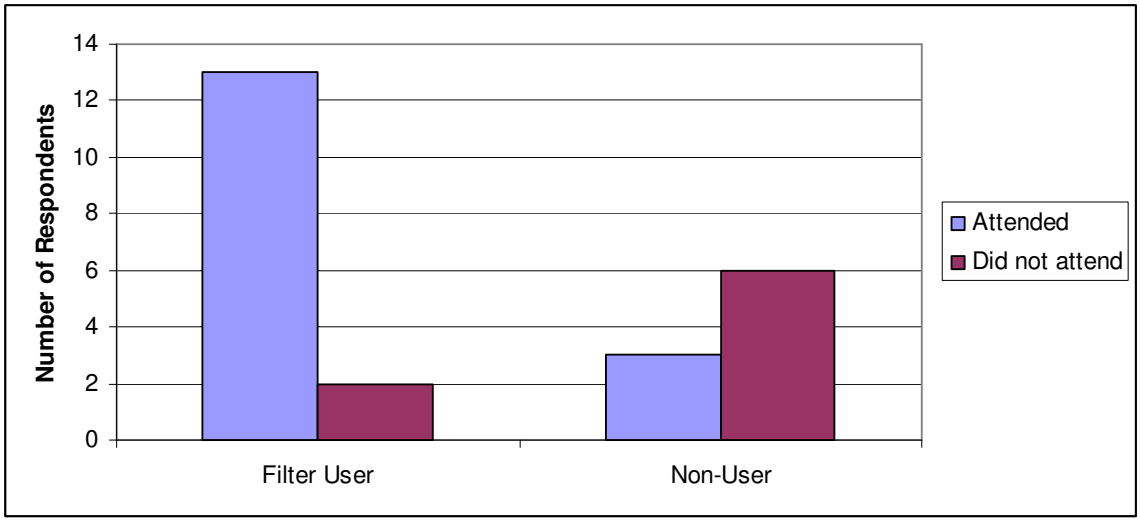

Figure 5: Attendance at Pure Home Water's village presentation for respondents with and without ceramic filters.

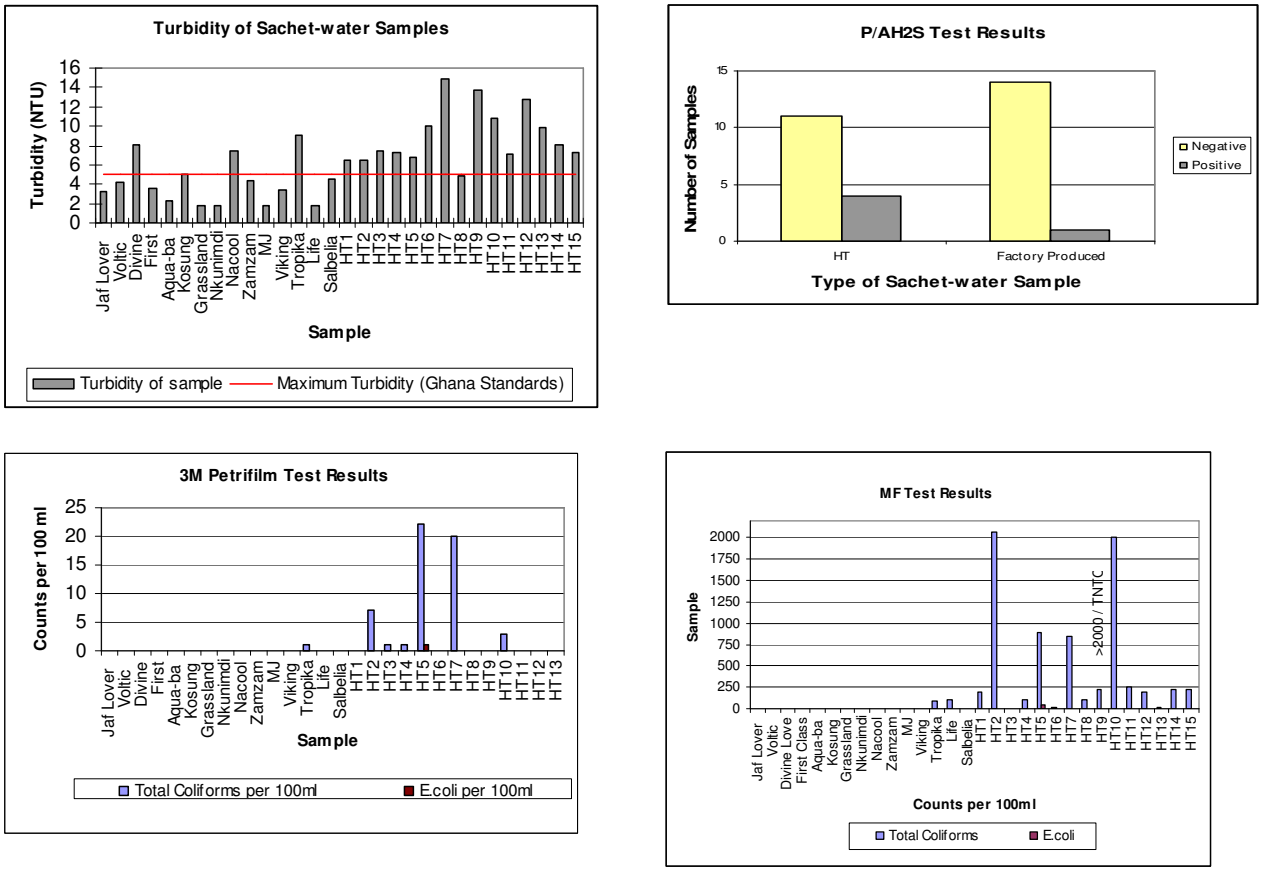

Figure 6: Water Quality Test Results on Hand-Tied (HT) and Factory-Produced Sachet-Water Samples

6.2 Questionaires

6.2.1 Ghana Household Questionnaire for Ceramic Filter Evaluation (Adapted from Peletz 2006)

Cross-sectional study

Hello, my name is Sophie Johnson, and I am student from MIT in the United States. We are conducting a household survey on water and sanitation in Ghana. We would like to talk with a woman of the household for about 30 minutes. Participation is voluntary; you may decline to answer any or all of the questions, and you may end the questionnaire early if you wish. All information will be kept confidential. Do you understand? Will you be willing to participate?

Yes	
No	

(If no, thank and close)

Interview background

Survey Number	
Surveyor	
HWTS Technology	
Name	
District	
Community	
Address	

Date	
Start Time	
End Time	
Water test #	
GPS number	
GPS coordinates	
Photo Description	

1. Household Information

1.1 Respondent's status

Mother	
Grandmother	

1.2 How many people live in the household? What are their ages?

Total Number in household	

Respondent's Age	

Age	Number of Members (including respondent)
≤ 5 years old	
6-15 years old	
16-59 years old	
≥ 60 years old	

1.3 Have you ever attended school?

Yes	
If so, how many years?	
No	

1.4 What are your average expenses each month?

1.5 Do you have _____?

Electricity	
Firewood	
Charcoal	
Gas	

1.6 OBSERVATIONS (socioeconomic)

House Type	
Floor Type	

1.7 How do you get your information (about events, news)? Information about water?

	General	Water
Meetings/presentation		
Radio		
Market		
Television		
Newspaper		
Other (specify):		

2. Diarrhea Knowledge

2.1 Has anyone in the household had diarrhea in the last week?

Yes	
No	

	Number that have had diarrhea	Number of days (list for each person)
≤ 5 years old		

5-15 years old		
16-59 years old		
≥ 60 years old		

2.2 What do you think is the main cause of diarrhea? Do you think _____ is a cause?
(First just ask what causes it, and then after response, read the list)

	Main cause	Probed response
Dirty water		
Dirty food		
Flies/insects		
Poor hygiene/ Environment		
Other(Specify):		
Unsure		

2.3 What do you do to treat diarrhea? How much does it cost?

	Treatment
Hospital	
ORS (oral rehydration salt)	
Salt/sugar solution	
Medicines	
Rice water	
Mashed Kenkey	
Bread	
Other (specify):	

2.4 If someone gets sick with diarrhea, who takes care of them? (CHECK, DON'T READ)

Mother	
Father	
Grandmother	
Grandfather	
Male child	
Female child	
Other(Specify):	

3. Household Hygiene and Sanitation

3.1 When do you wash your hands? Do you wash your hands _____?

	Yes	No
After the toilet		
Before eating		

Before cooking		
Other(Specify):		

3.2 Do you use soap when washing your hands? Do you have soap right now?

	Use	Have
Yes		
No		

3.3 What type of toilet facility do you use? (DON'T READ THE LIST)

	Check	Always available?	Public/Private/Shared
Flush toilet/WC			
KVIP Latrine			
Pit/Pan latrine			
Free range			
Other(specify):			

3.4 How far away is the toilet facility? (CHECK AND WRITE THE TIME)

In House	
Time to facility	

3.5 Is hand-washing facility available where you go to the toilet?

Yes	
No	

4. Water Use Practices

Source collection

4.1 Where do you get your drinking water during the DRY season? (Is another source used if first is unavailable?)

Improved Source	Always	Sometimes	**Unimproved Source**	Always	Sometimes
Household tap			Surface (lake/river)		
Protected Well			Unprotected well		
Protected Spring			Unprotected spring		
Borehole			Tanker truck water		
Rainwater collection			Water vendor: bottled (cost)		
Public standpipe			Water vendor: Sachet (cost)		
Other (specify):			Other (specify):		

Where do you get your drinking water during the WET season? (Is another source used if first is unavailable?)

Improved Source	Always	Sometimes	**Unimproved Source**	Always	Sometimes
Household tap			Surface (lake/river)		
Protected Well			Unprotected well		
Protected Spring			Unprotected spring		
Borehole			Tanker truck water		
Rainwater collection			Water vendor: bottled (cost)		
Public standpipe			Water vendor: Sachet (Pure or Ice, cost)		
Other (specify):			Other (specify):		

4.2 If you are getting water from a pump, have there been more than 10 days without operation in the last year (in 2006)?

N/A	
Yes	
No	

If you are getting water from a tap, how many days a week is the water flowing?

Number of days	

IF WATER IS FROM A TAP INSIDE THE HOME, GO TO QUESTION 4.6

4.3 Who collects the water?

Mother	
Father	
Grandmother	
Male Child	
Female Child	
Other(specify):	

4.4 How many times each day do you collect water?

Dry season	
Wet season	

4.5 How long does it take to collect water, including going, filling, and returning? (TIME)

	Under 30 min	Over 30 min
Wet Season		
Dry Season		

4.6 When not at home, from what source do you drink?

Improved Source	Always	Sometimes	Never	**Unimproved Source**	Always	Sometimes	Never
Household tap				Surface (lake/river)			

Protected Well				Unprotected well			
Protected Spring				Unprotected spring			
Borehole				Tanker truck water			
Rainwater collection				Water vendor: bottled (cost)			
Public standpipe				Water vendor: Sachet (Pure or Ice, cost)			
Other (specify):				Other (specify):			

Water Storage

4.7 Where do you store your drinking water (before drinking, after filtering or collecting)?

	Number	Narrow mouthed?
Ceramic vessels		
Metal buckets		
Plastic buckets		
Jerry can		
Small pans		
Cooking pots		
Plastic bottles		
Other(specify):		

4.8 Are your storage vessels always covered?

Yes	
No	

4.9 Do you use the stored water for any other purposes besides drinking water?

Yes	
No	

What purposes? Do you use it for _____?

Everything	
Cooking	
Bathing	
Cleaning	
Washing	
Other(specify):	

4.10 How do you take water from the containers?

Pour directly	
Draw with cup/scoop **with handle**	
Draw with cup/scoop **without handle**	
Spigot on container	
Other(specify):	

Water Quality Perception

4.11 Do you think the water is safe to drink without treatment?

Yes	
No	

If not, why? (DO NOT READ LIST)

Dirty/turbid	
Microbial contamination	
Larvae/worms	
Causes malaria	
People get sick	
Other(specify)	
Unsure	

4.12 What system are you using to treat your water? Do you know about any other methods?

(Follow up questions: What if water is cloudy at collection? What if family members are sick?)

	Always	Sometimes
Boil		
Chemicals (tablets/liquid)		
Filter:		
CT Tamakloe ceramic		
Nnsupa candle		
Biosand		
Cloth		
Other filter (specify):		
Settle		
Safe storage		
SODIS (solar)		
Other (specify)		

4.13 Why do you use this method?

<u>Preparedness to use household treatment (WITHOUT technology)</u>

5.1 Would you like to treat your water before drinking?

Yes	
No	

If not, why not?

Cost	
Not necessary, water is clean	
Afraid to change water (add chemicals, etc.)	
Need to discuss with guardian/spouse	

5.2 How much are you prepared to spend on the treatment of your water? How much can you afford?

5.3 Who in the family usually decides what is necessary to buy for the household?

Mother	
Father	
Grandfather	
Other(specify):	

5.4 Are you aware of ceramic filters in your village?

Yes	
No	
Unsure	

If so, have you had water from it?

Yes	
No	

What do you think about its performance and the quality of the water it produces?

5.5 Are you ready to learn how to produce any of the HWTS products?

Yes	
No	

OTHER COMMENTS/QUESTIONS:

REMEMBER

Mark end time
Photo
Water sample
GPS coordinates

WITH HWTS Technology

A. Type

Ceramic CT Filtron	
Cermanic candle Nsupa filter	
Plastic safe storage container	

B. Why did you select this technology?

Cost	
Ease of Use	
Other:	

C. Did you attend a Pure Home Water presentation about the ceramic filter?

Yes	
No	

If not, where did you find out about it? (community liaison, relative, neighbor, school, etc.)

D. Who in the family decided to purchase the filter/technology?

Mother	
Father	
Other(specify):	

E. How many days a week do you use it?

Regular use (7 days)	
Irregular use (1-6 days)	
Non-users (0 days)	

F. Is the filtered/treated water better, worse or the same? (taste, odor)

Better	
Worse	
The Same	

G. Do you treat all of the water the family uses for drinking? If not, when not?

		When Not
Yes		
No		

H. Have you noticed any health improvement since you started using HWTS?

Yes	
No	

I. Who is responsible for treating the water?

Mother	
Father	
Grandmother	
Male Child	
Female Child	
Other(specify):	

HWTS Acceptability

A. Are you happy with the technology? Why or why not?

Yes		Why:
No		Why not:

B. Is it easy to use?

Yes	
No	

C. Would you recommend to others?

Yes	
No	

D. Have you had any problems with the technology? If so, what? How often?

		What	How often
Yes			
No			

HWTS Operation and Maintenance

A. Do you clean the technology? How often?

		How Often
Yes		
No		

B. Do you use another treatment method is the filter is not working well?

C. Do you think you have enough resources ($, info, skills) to keep the HTWS running?

Yes	
No	

D. If it was broken, would you buy a new one? How much are you willing to pay?

		Willing to pay? (Amount)
Yes		
No		

E. Do you think your neighbors would buy one for this price?

Yes	
No	

F. Are you ready to learn how to produce any of the HWTS products?

Yes	
No	

OTHER COMMENTS/QUESTIONS:

REMEMBER

Mark end time
Photo
Water sample
GPS coordinates

6.2.2 Questionnaire Directed to Sachet Water Customer

GENERAL INFORMATION

Interviewee Description

	Frequency	Percentage
Passer-by	22	73.3
Business owner	8	26.7
Total	30	100.0

Location of Interview

	Frequency	Percentage
Tamale	21	70.0
Savalugu	9	30.0
Total	30	100.0

Sex of Interviewee

	Frequency	Percentage
Male	18	60.0
Female	12	40.0
Total	30	100.0

Age of Interviewee

Response	Frequency	Percentage
<=15	1	3.3
16-20	7	23.3
21-40	16	53.3
41-60	5	16.7
>60	1	3.3
Total	30	100.0

TYPE OF SACHET WATER PURCHASED

Do you buy sachet water?

Response	Frequency	Percentage
Yes	30	100.0
No	0	0.0
Total	30	100.0

If 'Yes' what type do you buy?

Response	Frequency	Percentage
Hand-tied	3	10.0
Factory-produced	14	46.7
Both	13	43.3
Total	30	100.0

Which brand of factory produced water do you prefer to buy?

Response	Frequency	Percentage
Voltic	12	40.0
Zamzam	1	3.3
Aspect	1	3.3
Jaf-Lover	3	10.0
Standard-water	1	3.3
Aquaba & Divine Love	1	3.3
No specific preference	8	26.7
N/A	3	10.0
Total	30	100.0

Why do you prefer to buy the brand specified?

Response	Frequency	Percentage
Better quality	6	20.0
Better packaging	1	3.3
Better taste	5	16.7
Cheaper and better taste	1	3.3
Convenient to reach vendor	1	3.3
Likes the name	3	10.0

Been in market for long	2	6.7
N/A	11	36.7
Total	30	100.0

PERCEPTION ON PRICE

What do you feel about the price of hand-tied water?

Response	Frequency	Percentage
Cheap	7	23.3
Affordable	23	76.7
Total	30	100.0

What do you feel about the price of factory-produced water?

Response	Frequency	Percentage
Cheap	3	10.0
Affordable	15	50.0
Expensive	10	33.3
N/A (Not able to comment)	2	6.7
Total	30	100.0

PLACE

How far do you go to access the sachet water?

Response	Frequency	Percentage
En route final destination	8	26.7
Delivered	5	16.7
<100m	10	33.3
>100m	3	10.0
En route final destination or delivered	4	13.3
Total	30	100.0

PERCEPTION ON PRODUCT AND SERVICES

What do you feel about the service quality of sachet-water vendors?

Response	Frequency	Percentage
Always good	21	70.0
Usually good	9	30.0
Total	30	100.0

What do you feel about the quality of hand-tied water?

Response	Frequency	Percentage
Good	10	33.3
Fair	2	6.7
Poor	6	20.0
Uncertain	12	40.0
Total	30	100.0

What do you feel about the quality of factory-produced?

Response	Frequency	Percentage
Good	24	80.0
Fair	3	10.0

Poor	2	6.7
Uncertain	1	3.3
Total	30	100.0

Do you buy water from a particular vendor(s)?

Response	Frequency	Percentage
No	14	46.7
Yes	14	46.7
Sometimes	2	6.7
Total	30	100.0

If 'yes', what makes you choose to buy from the particular vendor(s)?

Response	Frequency	Percentage
Trusted quality of water	7	23.3
Convenient to reach	7	23.3
Offers credit	1	3.3
Friendlier/good attitude	1	3.3
N/A	14	46.7
Total	30	100.0

What kind of improvements would you suggest for the vendors?

Response	Frequency	Percentage
Improve packaging for hand-tied sachet water	3	10.0
Improve quality/taste of hand-tied sachet water	4	13.3
Improve packaging and increase volume of for hand-tied sachet water	1	3.3
Allow customers to pick sachets themselves when they buy and not to dip sachets in melted ice	1	3.3
Improve quality/taste of both factory-produced and hand-tied sachet water	1	3.3
Improve quality of factory produced sachet water	1	3.3
Improve taste of factory produced sachet water	3	10.0
Reduce price of factory-produced sachet water	1	3.3
Increase quantity and reduce price of factory produced sachet water	1	3.3
None	14	46.7
Total	30	100.0

SOURCES AND AMOUNT OF WATER AT HOME/AWAY FROM HOME

What other sources of water you drink when away from home?

Response	Frequency	Percentage
Pipe/tap water	4	13.3
Bottled water	1	3.3
Pipe/tap and well water	2	6.7
Pipe/tap and bottled water	1	3.3
None other	22	73.3
Total	30	100.0

How many days per week do you work (away from home)?

Response	Frequency	Percentage
5	4	13.3
6	11	36.7
7	7	23.3
Not defined	8	26.7
Total	30	100.0

How many hours a day do you work (away from home)?

Response	Frequency	Percentage
4 to 8	7	23.3
9 to 13	8	26.7
14 to 18	3	10.0
Not defined	12	40.0
Total	30	100.0

What is main source of drinking water at your home?

Response	Frequency	Percentage
Pipe/tap water	5	16.7
Sachet water	11	36.7
Bottled water	1	3.3
Pipe/tap water and sachet water	11	36.7
Pipe/tap water and vendor/tanker water	1	3.3
Pipe/tap water and dug-outs	1	3.3
Total	30	100.0

About how much water (glasses/ sachets of water) do you drink at home everyday? (Ans. Converted to equivalent liters)

Response	Frequency	Percentage
0-1.0litre	8	26.7
1.1 to 2.0 liters	18	60.0
2.1 to 3.0 liters	2	6.7
3.1 to 4.0 liters	1	3.3
4.1 to 5.0 liters	1	3.3
Total	30	100.0

About how much water (glasses/ sachets of water) away from home everyday?

Response	Frequency	Percentage
0-1.0litre	2	6.7
1.1 to 2.0 liters	11	36.7
2.1 to 3.0 liters	12	40.0
3.1 to 4.0 liters	1	3.3
4.1 to 5.0 liters	4	13.3
Total	30	100.0

Respondent drinks more water:

	Frequency	Percentage
At home	3	10.0
Away from home	21	70.0
Same at home and away from home	6	20.0
Total	30	100.0

OTHER – ENVIRONMENTAL CONCERNS

Where do you dispose of the sachet bag?

Response	Frequency	Percentage
Dust bin	14	46.7
Leave with vendor	1	3.3
Litter	8	26.7
Dust bin or leave with vendor	1	3.3
Dust bin or litter	6	20.0
Total	30	100.0

6.2.3 Questionnaire Directed to Road-side Sachet-water Vendors

GENERAL INFORMATION

Sachet water type

	Frequency	Percent
Hand-tied	3	30
Factory-produced	1	10
Hand-tied and factory produced	6	60
Total	10	100

Brand of pure-water

	Frequency	Percent
Jaf Lover	1	10
Grass land	1	10
Ko Sung	1	10
Viking	2	20
Voltic	1	10
First class	1	10
N/A (Hand-tied water)	3	30
Total	10	100

Sex of vendor

	Frequency	Percent
Female	10	100
Total	10	100

Age of vendor

	Frequency	Percent
<=15	4	40
16 to 20	4	40
21 to 40	2	20
Total	10	100

PLACE/PROMOTION

At what locations do you sell your sachet water?

Response	Frequency	Percent
No specific location	1	10
Mosque area	1	10
Market place	1	10
Taxi area and bus stop	2	20
Taxi area, bus stop and market place	5	50
Total	10	100

Why do you choose to sell at the specified places/locations/streets?

Response	Frequency	Percent
More sales/customers	7	70
Other business/activity conducted in the area	1	10

Not specified	2	20
Total	10	100

Who are your main customers?

Response	Frequency	Percent
No specific set of customers	3	30
Taxi drivers	5	50
Market sellers/vendors	1	10
Pedestrians	1	10
Total	10	100

PRICE

How much do you sell the hand-tied water for? (GHC)

Response	Frequency	Percent
200	9	90
N/A (does not sell hand-tied water)	1	10
Total	10	100

How much do you sell the factory-produced water for? (GHC)

Response	Frequency	Percent
400	7	70
N/A (does not sell factory-produced water)	3	30
Total	10	

About how much is generated per day from your sales?

Response	Frequency	Percent
<10,000	1	10
10,000 to 19,000	3	30
20,000 to 29,000	1	10
30,000 to 39,000	3	30
50,000	1	10
Don't Know	1	10
Total	10	100

BUSINESS STRUCTURE

Who owns the business?

Response	Frequency	Percent
Member of family	7	70
Non-member of family	1	10
Self	2	20
Total	10	100

If employed how much are you paid per day?

Response	Frequency	Percent
0	6	60
5,000	2	20
Owner	2	20
Total	10	100

How many days per week do you work?

Response	Frequency	Percent
5	1	10
6	4	40
7	5	50
Total	10	100

How many hours per week do you work?

Response	Frequency	Percent
<4	2	20
4 to 8	7	70
9 to 12	1	10
Total	10	100

WATER TREATMENT AND SAFE STORAGE

Where is the water you pack sourced from?

Response	Frequency	Percent
Tap/pipe water	8	80
Tanker	1	10
Other distributing vendor	1	10
Total	10	100

How do you treat the water?

Response	Frequency	Percent
Cloth filter	6	60
Sponge filter	3	30
Settling and sponge filter	1	10
Total	10	100

Where is the water stored after it is sourced?

Response	Frequency	Percent
20 liters plastic buckets	5	50
20 liters metal buckets and 20 liters jerry cans	1	10
200 liters metal drum	1	10
200 liters plastic drum	2	20
200 liters plastic drum and 20 liters metal basin	1	10
Total	10	100

Are the storage vessels narrow mouthed?

Response	Frequency	Percent
No	10	100

Are the storage vessels always covered?

Response	Frequency	Percent
No	2	20
Yes	8	80
Total	10	100

How do you draw water from the storage containers to into the sachets?

Response	Frequency	Percent
Cup/scoop with handle	8	80
Cup/scoop with handle and without handle	2	20
Total	10	100

HANDLING PRACTICES

How do you open the sachet bags to be able to fill them with water?

Response	Frequency	Percent
Rub bag together by hand	10	100

Do you wash your hands before bagging the water?

	Frequency	Percent
Yes	10	100

Do you wash your hands with soap before bagging the water?

Response	Frequency	Percent
No	1	10
Yes	9	90
Total	10	100

CAPACITY/WILLINGNESS TO TREAT WATER

How much are you prepared to spend on water treatment and safe storage products for your water?

Response	Frequency	Percent
10000	1	10
12000	1	10
50000	1	10
250000	2	20
Not sure	5	50
Total	10	100

6.3 Resource Report

Pure Home Water Contacts

Susan Murcott
Senior Lecturer, MIT Department of Civil and Environmental Engineering
Ms. Murcott has led the project from its inception. She has traveled to Ghana with teams of MIT students during January for the past two years.
murcott@mit.edu

Elizabeth Wood
Project Manager
Ms. Wood graduated from Harvard in 2006, and she moved to Savelugu in August 2006 to manage Pure Home Water.
lizwood@gmail.com

Hamdiyah Alhassan
Ms. Alhassan has a degree in civil engineering, and she joined Pure Home Water in August 2005.
abena567@yahoo.co.uk

Wahabu Salifu
Mr. Salifu has a degree in environmental planning, and he joined Pure Home Water in September 2005.
simonfobia@yahoo.co.uk

World Vision Contacts

Agnes Phillips
Executive Associate, World Vision Accra
Ms. Phillips helped us arrange lodging in Accra.
agnes_phillips@wvi.org

Past Ghana Teams

In January 2005, three Master of Engineering students and four G-Lab students traveled to the Northern Region to work with Pure Home Water. Their group reports and individual theses were valuable information sources. The reports can be found at http://mit.edu/watsan/.