

## ***Interactive comment on “Do low-cost ceramic water filters improve water security in rural South Africa?” by Jens Lange et al.***

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### **Answers to referee #3**

**General comments** The manuscript reports on the performance examination of a low-cost ceramic candle filter system (CCFS) for point of use (POU) drinking water treatment in the village of Hobeni, Eastern Cape Province, South Africa. The study presents an important contribution towards improving water security particularly in rural areas with disadvantaged communities like Hobeni villagers. The report emphasizes on the importance of carrying out performance monitoring programs once water treatment devices are distributed in the field rather than depending on data accumulated during laboratory tests. It is important the information presented in the manuscript to be shared among different stakeholders working in water sectors to improve means of se-

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curing water in area without centralized treatment systems. However, the authors are advised to work on the few comments below to improve the manuscript.

Our answer: We also thank the anonymous referee #3 for his thorough check and his constructive comments. This greatly helped to improve our manuscript.

#### Specific comments

Page 1 line 8–9-The second sentence in the abstract is not well connected with the 1st and 3rd statements. It is suggested to be moved down to line 14 or deleted, and thereby the word ‘moreover’ in line 9 will be deleted as well.

Our answer: We will change the abstract accordingly.

Page 2 line 25- Change the word ‘personal’ to ‘personnel’.

Our answer: We will change this accordingly.

Page 2 line 28- Delete the word ‘systems’ after CCFS

Our answer: We will change this accordingly.

Page 2 line 29- Change the word ‘thereby’ to ‘thereafter or subsequently’.

Our answer: We will change this accordingly.

Page 2 line 29- What were the criteria used to decide performance evaluation to be done after 8 months? Would it be possible to conduct the evaluation on monthly basis? Is there any possibility that the performance of the CCFS to be affected by seasons in a year?

Our answer: We decided to evaluate performance after 8 months, because this equals two thirds of the specified lifetime of the filter candles. Hence the systems should still work efficiently while malfunctions should turn out clearly. It is true that more frequent testing is advisable also to show the impacts of seasons, which was also proposed by referee #2. This we will recommend in the discussion section:

"Monitoring of CCFS performance should be carried out on a monthly basis to also include seasonal changes in water quality"

Page 2 line 26-30- Authors are advised to write this paragraph in past tense. The paragraph describes what was done in their research so is better if reported in past tense with passive voice.

Our answer: We will change this accordingly.

Page 3 line 10- Rearrange the words 'brand the name' to be read 'the brand name'

Our answer: We will change this accordingly.

Page 3 line 15-16- The rate of 1 L/h is able to produce adequate daily drinking water volume. This is with respect to what number of family members in a household?

Our answer: In general, CCFS have flow rates of approximately 1 L/h and produce 10 L of drinking water per day according to CAWST(2011). The specific CCFS tested by us can reach hourly rates of up to 4 L/h (Mwabi et al, 2013). This results in approximately 40 L/day that should suffice for an average household size of 6 persons in Hobeni. We will also provide a reference on human water need. We will re-formulate as follows:

In general, CCFS systems have flow rates of approximately 1 l h<sup>-1</sup>, depending on the batch volume (CAWST, 2011). The specific CCFS tested in this study can reach rates of up to 4 l h<sup>-1</sup> (Mwabi et al., 2013) making up approximately 40 l d<sup>-1</sup>. This volume can be regarded adequate for an average household of 6 family members in Hobeni, if a 3-4 l need of clean drinking water per person and day is assumed (Sawka et al., 2005).

Reference: Sawka, M.N., Cheuvront, S.N., Carter, R.: Human Water Needs, Nutrition Reviews 63, 30-39, 2005.

Page 5 line 11- If about 74 % of visited households had no access to toilet facilities, what were their practices? How have such practices affected the quality of drinking water sources? Based on this observation the authors may as well recommend for

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sanitation educational campaigns and behavioral change interventions in the area.

Our answer: A valuable comment, see also our answers to referee #1 where we wrote:

The rest of the households were indeed practicing open defecation at that time, which definitely can increase the fecal contamination of the water sources. We are not aware of behavioural change interventions in the area but will recommend those. Open defecation was one reason, why we started our project and distributed CCFS in the area. We will add the following sentences:

“The remaining 74% of the households were practicing open defecation, which must be considered as a serious threat for hygienic drinking water quality. This was one of the reasons why CCFS were distributed in Hobeni.”

We will also add this sentence in the conclusions: “We propose sanitation educational campaigns and behavioral change interventions to complement POU water treatment in Hobeni.”

Page 5 line 14-15- Does the absence of digestive affliction attributed to the use of CCFS? If yes, how long Hobeni people have been using CCFS? Were the authors the first to distribute CCFS or CCFS were there before this research. If test results indicated deteriorated water quality (presence of coliform bacteria) what made the communities not to have incidences of digestive afflictions? Were there any other intervention methods in the study area?

Our answer: We are not aware of other intervention campaigns to improve water security in Hobeni at that time and we were the first to distribute CCFS systems in this quantity. The low number of digestive afflictions (only 16% reported afflictions during the past five years in the survey) might also be due to the fact that those depend on self-reporting. As already stated in the newly added paragraph of relevant literature (requested by referee #2), self-reporting may produce substantial bias in performance tests of POU intervention methods. We will add the following sentence:

“...although morbidity rates depend on self-reporting from the household members that is known to produce substantial bias (Wolf et al., 2014, Clasen et al., 2015).”

#### References:

Clasen, T.F., Alexander, K.T., Sinclair, D., Boisson, S., Peletz, R., Chang, H.H., Majorin, F., Cairncross, S.: Interventions to improve water quality for preventing diarrhoea, Cochrane Database of Systematic Reviews 2015, Issue 10. Art. No.: CD004794, 2015, DOI: 10.1002/14651858.CD004794.pub3.

Wolf, J., Prüss-Ustün, A., Cumming, O., Bartram, J., Bonjour, S., Cairncross, S., Clasen, T., Colford, J. M., Curtis, V., De France, J., Fewtrell, L., Freeman, M.C., Gordon, B., Hunter, P.R., Jeandron, A., Johnston, R.B., Mäusezahl, D., Mathers, C., Neira, M., Higgins, J.P.T.: Assessing the impact of drinking water and sanitation on diarrhoeal disease in low- and middle-income settings: systematic review and meta-regression, *Tropical Medicine and International Health* 19 (8), 928–942, 2014, doi:10.1111/tmi.12331.

Page 5 line 16- Do the authors have any idea as to why the other 40 households abandoned the use of CCFS?

Our answer: We will include information from our survey and rewrite both the relevant paragraphs in the methodology and the result sections as follows:

Methodology (3.4): “At 51 of the visited households water from the CCFS could be tested. The remaining 40 units did not contain enough water for the testing procedure and only the survey was conducted.”

Results (4.2): “...Approximately eight months after distribution, 69 % (63 units) of the CCFS were still in regular use, 20% (18 units) were broken and 5.5% (5 units) of the households refused to use the filters due to different reasons. In 5.5% of the households (5 units) the CCFS were used only temporarily. The majority of the households (60 %) liked the clean water after the filtering procedure.....”

Page 6 line 9-10- The analysis procedure for dip slides as described on page 4 involves

incubation of the pedals and vials after exposure time. How accessible are the incubation facilities to the CCFS household users in remote rural villages like Hobeni for them to be able to monitor the CCFS efficiency using this technology?

Our answer: We used a cheap, portable incubator for animal eggs to incubate the dip slides directly in the field. This can principally be used by rural communities themselves. This we will state in the manuscript:

“For the incubation of dip slides we used a cost-effective, portable, ventilated animal egg incubator with low energy consumption (220V-240V, <60 W, ZJchao).”

Page 7 line 5- Change the word ‘beyond’ to ‘below’.

Our answer: We will change this accordingly.

Page 14 figure 5- Authors needs to redraw the figure and extend the scale to include even the highest frequency parameters. Also y-axis needs to be labeled.

Our answer: We will change this accordingly.

Page 16 figure 7- Authors are advised to indicate the unit for levels of education in the figure.

Our answer: The units are years spent for education. We will include this in the updated figure 7.

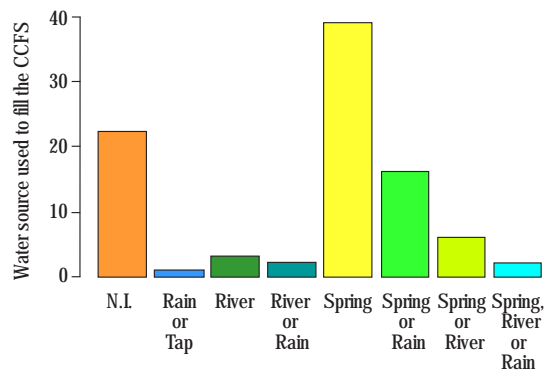
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**Fig. 1.** Updated figure 5

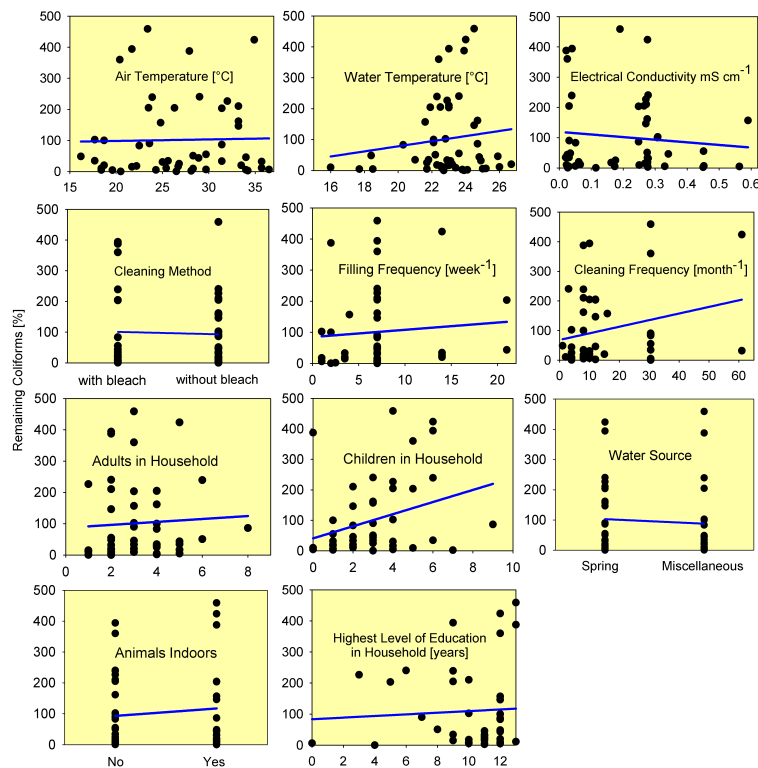


Fig. 2. Updated Figure 7

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