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Drinking Water Engineering and Science Discussions

Interactive comment on "Micro-components survey of residential indoor water consumption in Chiang Mai" *by* Y. Otaki et al.

Y. Otaki

yurina00@nifty.com

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I will answer to author comment #2 and change my article according to your comment as follows:.

*How exactly are the water supply systems to the sample homes configured? Does a home have only one tap? Where is the tap? How far? / I add the following explanation into line 19 (p49): Usually, there were two to eight taps per house for indoor use. Most of taps located inside house, and some taps, usually taps for laundry, located outside house.

*Is mountainous water supplied the same way? How is rainwater typically harvested?/ I add the following explanation into line 11 (p50): Regardless of the type of water re-

sources, water supply network inside house is almost the same. In case of community water and mountainous water, each household connects to the main pipe and water run through water supply network inside house and flows off from the tap. In case of ground water, each household pumps up the ground water and water run through water supply network inside house and flows off from the tap, too. In case of rainwater, it is collected and settled in large container (Figure 5). The selected water flow from the tap placed to the container.

*Were the sample homes for the dry and wet seasons different? Why are the numbers different?/ I add the following explanation into line 21 (p49): Basically, the measurement was done for the same households in both dry and rainy seasons. The survey in dry season was conducted for 63 households, then that in rainy season was conducted for 55 households, because some households were unfortunately absent during the meter setting period.

*What exactly does dry and wet season mean in this paper? Over how long period was each home sampled? Only for one battery cycle of two weeks?/ It is a predetermined calendar interval. I changed the original phrase in line 8 (p49) to as follows: Figure 3 plots the monthly average temperature and rainfall in Chiang Mai. This survey was conducted during the rainy season, from 7th January, 2004 to 1st March, 2004, and the dry season, from 28th July, 2004 to 5th September, 2004. Also, I add the following phrase into line 21 (p49): (set the meters to each tap of each household) for about one month, and calculated average dairy water consumption per capita.

*The distribution of the water use for different purposes needs to be explained./ I add the photo of equipment as Figure 4 and explanation into line 22 (p49): What is more commonly the case is that water from one tap uses for both toilet and bath. (In cases where it was impossible to divide activities, we exempted that particular tap from the survey.) Thus, all indoor activities were not always measured in all households. For example, some were measured all activities (toilet, bath, laundry, and kitchen), the others were measured toilet and kitchen.

*How was the demand for hand washing calculated?/ I add the explanation into line 25 (p51): both machine-wash and hand-wash amounts were measured

*More general discussion needs in the end/ I add the general discussion that provides general guidance for water demand estimation in the end of this article. I calculate per capita water demand in the future for both water awareness scenario and usual scenario as follows: Important findings from this survey were not only to get the detailed data of water consumption but also to get to know the lifestyle and traditional water use patterns and that most of households in middle-developed country still use old-fashioned appliances even in large city. For example, only 30% households used flush toilet, the twin-tub washing machine was popular, and 30% households did not use shower. Along with the general level of development, the appliances of new type will be introduced and the water demand will certainly increase. On this occasion, the future water demand depends on whether to introduce water-saving appliances or not. Table 3 shows the estimation of future water demand per capita per day for two scenarios. Water consciousness scenario means that the government and inhabitants willingly try to introduce water-saving appliances, and usual scenario means that people do not use such appliances. Current pail toilet needs about 4L per use and will be replaced to flush toilet in future. Toilet consumption will surely increase, and it will differ greatly whether they introduce water-saving flush toilet (6L/flush) or usual flush toilet (10L/flush). Regarding cloth-wash, current popular type is twin-tub washing machine, whose consumption per one load is assumed about 100L. It will be replaced to fully automatic type, whose water-saving type consumes about 90L per one load and usual type consumes about 150L per one load. If water-saving type becomes widely used, laundry use will become lower than at present. Bath water will certainly increase both scenarios. In Singapore, whose climate is closely resemble that in Thailand, average consumption in bath is 75L/p/d, which make up 45% of total indoor use. There is a possibility to increase bath water in Chiang Mai to the Singapore level. Although low flow shower-head has been developed, it proved ineffective (DeOreo, 2001). Consequently, estimation of bath use is 75L/p/d for both scenarios. There could not be factors to in-

crease water use in kitchen in the future. In this study, the median value in dry season was 19L/p/d. This value is not so small in comparison with the value in Singapore, 17L/p/d. Therefore, we assumed the use in kitchen will not increase in both scenarios. Total estimation value differs by scenarios. Thus, when planning the future water supply in middle-developed countries, we have to encourage people to install water-saving appliances in conjunction with the planning. It will avoid the waste of time, money, and over-development.

Interactive comment on Drink. Water Eng. Sci. Discuss., 1, 45, 2008.