washplus

Technical Brief March 2014

What Do Cooks Want? What Will They Pay?

A Study of Improved Cookstoves in Bangladesh

As the evidence base linking improved cookstoves (ICS) with positive health and energy impacts grows, so does attention to how best to influence household uptake and consistent and correct use. Appropriately, attention focuses on how to improve the field performance of the stoves themselves and make them more affordable, accessible, and appealing to the neediest consumers.

WASHplus conducted a comprehensive assessment to better understand consumer needs and preferences as they relate to increasing the uptake of ICS in Bangladesh, including household trials of improved stoves. This research, supported by USAID/Bangladesh, the USAID Asia Regional Bureau/Washington, and a grant contribution from the U.S. State Department's Office of the Secretary of State, Global Partnership Initiative, will contribute to the USAID/Bangladesh Catalyzing Clean Energy in Bangladesh program and actvities undertaken by key actors.

Innovative Methodology

Using qualitative and quantitative methods, this study draws from social marketing and social science to explore consumer perceptions of five promising ICS potentially (though not currently) available for distribution in Bangladesh. The study complements other efforts by a range of stakeholders to strengthen market-based approaches and consumer choice for improving household air quality and reducing the environmental impacts associated with dependence on biomass fuels.

To assess consumer preferences, researchers applied an innovative methodology called Trials of Improved Practices, or TIPs. The WASHplus application of the TIPs method uses "elicitation questions," which are semi-structured questions developed and validated to systematically identify barriers and motivators to change, including which factors are most influential in spurring the performance or nonperformance of a behavior.

ICS fuel efficiency was measured using a three-day kitchen performance test (KPT), widely acknowledged as the best currently available method for accurately estimating daily household fuel consumption. The KPT was carried out using a cross-sectional study design in 116 study households and 24 control households. Two approaches were used to measure the

The improved cookstoves used in the Phase One trial , clockwise from top left: Eco-Chula, Prakti, Envirofit, EcoZoom, and Greenway.

The mythical stove many consumers want is large and stable, yet portable, with a modern, well-made design. It cooks large volumes of food and has two active burners. Flames are hot and leap to touch the pots, but do not make them black. The stove can use multiple fuels, which can be fed in relatively unprocessed.

USAID FROM THE AMERICAN PEOPLE

extent to which households adopted the new stoves and the manner in which they integrated them into their cooking and kitchen management practices: self-reported use of stoves at the end of each 24-hour KPT monitoring period and stove use monitoring sensors (SUMS). The SUMS recorded the stove temperature every 10 minutes for a total of approximately 10 days; the resulting temperature profiles were then analyzed to determine the frequency of "cooking events" (i.e., number of times the stoves were lit) per day. The impact of the interventions on household air quality was explored during the KPT monitoring; illustrative (not statistically significant) results were collected from measures of minute-by-minute kitchen concentrations (in a location approximating the breathing zone of the cook) of small particles (PM2.5) and carbon monoxide (CO). The impact of the interventions on women and children's exposure was explored in the same subset of homes by monitoring the 24-hour exposure to CO of both the cook and one child under the age of 5 in the household.

Stove-Testing Procedure

The field survey was conducted in January and February 2013, in two wood-fuel burning areas of Bangladesh—Sylhet in the northwest and Barisal in the south. Both areas use wood as the primary fuel (confirmed during the research in 105 of the 120 participating households). Two partner NGOs selected the study villages. In Barisal the villages were Billobari, Bihangal, Ichakathi, and Gonpara. In Sylhet the villages selected for the study were Jangail, Kewa, Tilargaon, and Kunarchor. In Barisal cooking usually takes place either in an open courtyard in a semi-permanent structure or in a separate kitchen away from the main house. In Sylhet the cooking takes place in the main living quarters; many of the households cook on traditional stoves placed under chimney hoods that pull smoke out of the living quarters.

Five different imported ICS models were placed in homes, with three of each stove type per village, thus totaling 15 households per village in eight villages, or 120 total households. Households were selected according to basic criteria of using primarily wood for cooking, having at least four people in the household with at least one child under 5. The stoves tested in this study were all imported from elsewhere in the region and were not specifically designed for the Bangladesh market. These were the single pot, built-in-place, rocket design stove (Envirofit Z3000), a single pot, portable, rocket design stove (EcoZoom Dura), a two-pot portable metal chimney stove (Prakti LeoChimney), a single-pot portable fan gasifier stove (Eco-Chula), and a single-pot portable natural draft gasifier stove (Greenway). Only one of the five (Greenway) was available for purchase in Bangladesh at the time of the study.

Each household in the trial was only provided one type of stove to test. Detailed cookstove operation and maintenance training was provided; cooks were asked to try out stoves under normal conditions for three weeks and offer feedback and opinions. Unlike other survey methods, where all factors are held constant and researchers analyze the frequency and range of response, this qualitative methodology invites households to identify, discuss, and resolve barriers to using the new ICS. Households were also asked to compare cooking on the ICS with their traditional stove on a range of criteria. Through these comparisons, researchers were able to elicit categories of attributes valued by the target consumer. Interviews were conducted at Day 1, Day 3, and Day 21.

Findings

The study clearly showed that at least two stoves were perceived as preferable to traditional cookstoves by many of those who tried them. As is common among improved stove interventions (Ruiz-Mercado et al. 2011 and 2013; Pine et al. 2012; Schepers and Wetzels 2007), none as currently produced met all consumer needs, and none met sufficient consumer needs to completely replace traditional stoves. Consumers most appreciated the Prakti and Eco-Chula stoves, with the preference for each stove varying by district.

Overall Consumer Reactions to New Stoves on Key Variables

Overall, consumers reported liking the new stoves, which was a distinct indicator separate from whether or not they preferred the ICS to the traditional stove. These general reactions were common across stove types.

When asked about differences in smoke produced, a vast majority (85) said the ICS produced less smoke than their traditional stoves. A major obstacle reported is that the cooking time was slower using the ICS. Three-fourths of respondents (91) reported slower cooking time, a fifth (24) reported faster, and just a few (3) respondents said cooking time was the same.

Dislikes and suggestions for improvement fell into two general categories, those that can be addressed through fairly simple modifications to the stove design and others more appropriately addressed through point-of-purchase consumer education and follow up from service agents or health outreach workers.

The most overarching complaint about all the cookstoves included in the trial was their inability to cook large volumes of food in large pots, especially the Prakti and Greenway cookstoves. Study participants compensated for this by jamming the stove with more fuel and wrestling with large pots, which rendered some stoves less stable. As is common with other stove studies, partici-

The word cloud above represents attributes named by all consumers trying the ICS in response to asking what the participants liked about the new stoves compared to their old stove after three weeks. Larger type reflects the frequency of mention of the attribute.

pants were unaccustomed and/or unwilling to chop wood into small pieces, thus complaints were received about the size and angle of the wood opening. Traditional stoves are constructed so as to allow a "natural feed" of large wood pieces and other agrofuels and dungsticks; because the opening into the combustion chamber angles downward, the fuel naturally slides further into the combustion chamber as it burns. Consumers missed this feature on the new stoves; improved stoves have a horizontal fuel entry, so fuel must be manually pushed into the stove as it burns. Lastly, consumers found that excess ash collected in the stove and suggested a tray for easy emptying. While this last item should be considered, some of the ash build up was due to excessive amounts of wood being burned in the stoves. In case of the Prakti stove the major complaint was that the second pot was not effective for cooking. For the Greenway stove a major complaint was that the stove is not stable. Besides these two specific concerns, complaints were similar across all stove types.

The mythical stove many consumers want is large and stable, yet portable, with a modern, well-made design. It cooks large volumes of food and has two active burners. Flames are hot and leap to touch the pots, but do not make them black. The stove can use multiple fuels, which can be fed in relatively unprocessed. Wood in particular can be stuffed in large pieces, and left to feed almost automatically.

Some of the problems and suggested changes can be fairly easily addressed by manufacturers. But some of the desired criteria above are contradictory (leaping flames and clean pots), thermo-dynamically impossible, or undesirable from a fuel-efficiency standpoint. These clearly indicate a consumer education opportunity, to help consumers better understand that some of the stove features under discussion (e.g., size of fuel opening and lack of visible flames leaping from the stove) are critical to improved combustion efficiency and heat transfer; in other words they are key requirements of the improved stove. WASHplus suggests a range of education and information be delivered to consumers through point of purchase sales materials and interaction with distributors and sales people, in promotional material, and through health or other outreach activities. Addressing such issues will be essential for consistent and correct use of ICS, for consumer satisfaction, and related word-of-mouth recommendations.

Perceived Value and Willingness to Pay

Study participants valued stoves for certain features, but dramatically undervalued the monetary worth of the stove. Most participants estimated the monetary value of the stoves to be one-half to one-quarter of their actual calculated value (which already includes an assumed carbon subsidy). Of the 120 households, 105 study participants were given the option to purchase the stoves at the market value. Only one opted to do so, and a second nonparticipant neighbor purchased a stove. Using a second methodology, however, the remaining 15 households were offered the stoves as gifts, and were then given an option of a cash buyout at market value. Surprisingly, only three opted for the (relatively significant amount of) cash; the other 12 preferred to keep their stove.

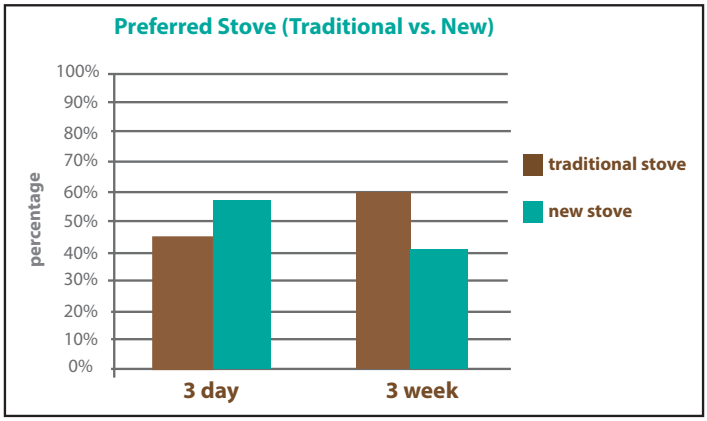
Summary KPT and SUMS Findings

Usage patterns captured during KPT monitoring suggest the intervention stoves were commonly used by all of the study households, but in all cases did not fully displace the use of the traditional stove. Homes using four out of the five improved stoves were found to use at least 16 percent to 30 percent less fuel than the control homes over the course of the KPT, a range that may be somewhat artificially low due to underreported fuel mixing in control homes.

Discussion

One surprising finding from the study was the dramatic decrease in acceptance of ALL the improved stoves between the Day 3 and Day 21 surveys (see graph, next page). This was especially pronounced for the Eco-Chula stove. Our reporting indicated that people initially liked the Eco-Chula because it was portable and clean burning with little smoke (especially valuable in Barisal where people cook in semi-enclosed areas without smoke hoods), but over time they grew to resent having to chop wood into small pieces, as required by the stove, and having to sit by the stove continuously adding wood pieces, rather than being able to multi-task as they were accustomed to doing.

According to the stove users, they like the various



stoves and would have liked to keep them if given for free or at a nominal cost. Improved stoves would not replace traditional stoves, rather complement their use under various conditions. Householders realized that these metal stoves are expensive, but they were not ready to buy them at market price. The various reasons put forward by them were, as follows:

- The stove model is small and cannot completely replace the primary stove.
- They had participated in the study, so the stove should be given to them at a nominal price or free.
- They could not risk paying so much money for an experimental model since after the study there will be no service.
- They do not want to buy the stoves on installments because they would end up paying much more for the stove once interest and/or service fee for the loan was incorporated.

The results of the buy-back willingness to pay assessment, however, lead the team to observe that the participants valued the stove and preferred it over its cash equivalent when they did not have to make sacrifices to their household economy to keep it and when they did not have to come up with funds from what was an already tight household budget in most cases.

Recommendations

Unsurprisingly, this study generates other questions and areas to investigate. Among the recommendations:

Because none of the currently available ICS models met all expressed consumer needs, further stove design improvements for the Bangladesh market are needed as is further consumer preference testing.

Larger and higher firepower two-pot stoves should be trialed in Bangladesh. Although we did include a two-pot stove in the trial, users complained that the second burner did not burn hot enough to boil water or cook rice. Because of dependence on free agrofuels, trialing of a rice husk and/or mixed fuel stove is suggested.

During the study the truly aspirational BioLite HomeStove, which may have been very popular in Bangladesh given cell phone penetration rates and the stove's ability to recharge cell phones, was unavailable. The BioLite is now back in production, and should be included in a future stove trial.

In addition, given the mixed reception of the improved stoves trialed in this study, and clear unwillingness to pay, WASHplus recommends that these improved stoves be compared with Bondhu Chula models to assess relative preferences and performance, since our policy-making and program implementing audience may interpret from the findings of this report that they should continue to promote Bondhu Chula stoves, despite their mediocre field performance.

Next Steps

Under Phase 2 of WASHplus activities, WASHplus, in collaboration with the Global Alliance for Clean Cookstoves, is developing a generic marketing and behavior change strategy; suggesting a limited number of evidence-based approaches to increase the uptake of stoves; concept testing key elements of these approaches; and developing practical "how-to" tools to contribute to the goals and results of USAID energy and health objectives in Bangladesh. This will draw on lessons learned in Bangladesh and other countries in the South Asia region in behavior change, demand creation, and marketing of sanitation, water treatment products, and cookstoves.

The full length report that this brief is based on is available at: http://www.washplus.org/sites/default/files/bangladesh-consumer_preference2013.pdf.

Endnotes

Ruiz-Mercado I. et al. 2013. Quantitative Metrics of Stove Adoption Using Stove Use Monitors (SUMs). Biomass and Bioenergy (73) 10: 136–148. http://dx.doi.org/10.1016/j.biombioe.2013.07.002

Pine K. et al. 2012. Adoption and Use of Improved Biomass Stoves in Rural Mexico. Energy for Sustained Development. (15) 2: 176–183. http://dx.doi.org/10.1016/j.esd.2011.04.001

Ruiz-Mercado, I. et al. 2011. Adoption and Sustained Use of Improved Cookstoves. Energy Policy. DOI:10.1016/j.enpol.2011.03.028

Schepers J. and M. Wetzels. 2007. A Meta-Analysis of the Technology Acceptance Model: Investigating Subjective Norm and Moderation Effects. Information & Management. (44) 90–103.

For more information contact:

Julia Rosenbaum, Deputy Director, WASHplus
jrosenbaum@fhi360.org
www.washplus.org