Designing cookstove labels to influence consumer behavior in Ghana

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Abstract

Three billion people in low- and middle-income countries use cooking fuels and technologies that pose health risks associated with household air pollution, and environmental impacts associated with GHG emissions and deforestation. In response, efforts are underway across the globe to transition households to cleaner, safer, and more fuel-efficient cookstoves. The government of Ghana is planning to launch a new national performance standards and labeling (S&L) program for improved cookstoves, in an effort to increase the uptake of ICS across their urban and rural populations. This paper discusses the development of the Ghana improved cookstove label, specifically two components: informed visual label design, and setting performance thresholds for label tiers (tier-setting). The paper includes the approach and methodology for both components, as well as preliminary results from consumer research on preferences and behavior change in response to cookstove labels, and analysis and recommendations for label tiers.

Introduction

More than seventy percent of Ghanaians use biomass fuel for cooking and are exposed to harmful pollutants emitted by the incomplete combustion of biomass (firewood, charcoal, agri-waste, etc.). Around 13,400 deaths occur per annum in Ghana from smoke related illnesses attributable to household air pollution from the use of biomass for cooking.[1] Due to their high exposure to cookstoves in the home, children under the age of five are considered most vulnerable.[2] In Ghana and around the world, the market for improved cookstoves and alternative fuels is nascent. Many national and international initiatives are already underway to make better cookstoves and alternative fuels available to Ghanaians, including private manufacturer initiatives through profit-based business models, non-governmental initiatives, and ongoing government initiatives. Most of these programs focus on the charcoal stoves used by approximately thirty two percent[3] of households. In urban areas, liquid petroleum gas (LPG) has significant market penetration as a cooking fuel, with about twenty two percent of households – or about thirty-six percent of the urban population – using LPG as their primary cooking fuel.[3]

The government of Ghana recognizes the dire harm caused by open fires and traditional stoves and is seeking to transition consumers from traditional biomass stoves to improved stoves by developing and implementing performance standards and labels (S&L) for biomass cookstoves. To assist the development of the labeling portion of this initiative, the Ghana Energy Commission (regulator for the energy sector including biomass fuels and end-use devices) partnered with the Global Alliance for Clean Cookstoves (Alliance) and CLASP to transfer and apply best practices from energy efficiency labeling programs

1. Global Alliance for Clean Cookstoves (GACC), at: http://cleancookstoves.org/country-profiles/focus-countries/1-ghana.html.

2. WHO, Indoor Air Thematic Briefing 2, p 2 available at: http://www.who.int/indoorair/info/briefing2.pdf.

3. Ghana Statistical Service, 2014. Ghana Living Standards Survey Round 6 (GLSS 6) Main Report.

for *on-grid* appliances (i.e. electric appliances such as air conditioners and refrigerators). A project was undertaken that consisted of two components: consumer research to inform label design, and tier-setting analysis.

The rationale for undertaking consumer research to inform label design reflected both best practice for electrical appliances, and the need to address a data gap – very limited research is available anywhere on consumer comprehension, behavior, and attitudes towards, and in response to, cookstove labels. This information is essential for the Ghana Energy Commission to design an effective cookstoves label that will resonate with cookstove consumers, and inform broader policy interventions, including standards and labeling awareness campaigns.

While some Ghanaian consumers are already familiar with energy labels on refrigerators, air conditioners (ACs) and compact fluorescent lamps (CFLs), cookstoves are used by almost all households, including rural communities, which may not be familiar with existing energy efficiency labels. Any potential lack of familiarity or misunderstanding of labels by consumers could present a risk to the program and broader clean cooking initiatives. Even those familiar with labels could struggle to interpret cookstove labels, which will need to convey simultaneously two primary product performance measures: emissions, which convey overall health and environmental impacts, and efficiency, which conveys fuel savings and economic impacts.

Tier-setting analysis was undertaken, in parallel with the visual label design and underlying consumer research, to establish recommendations for thermal efficiency and emissions levels for a potential comparative-style label.

Approach and Methodology

CONSUMER RESEARCH AND LABEL DESIGN

The objective of the consumer research was to assess how label elements and full label variations influence consumers':

1. Purchasing decisions,
2. Priorities while buying cookstoves (e.g. stove type, price, fuel efficiency, emissions),
3. Understanding of cookstove performance, and different stove types' strengths and weakness,
4. Responses to technology-neutral vs technology-specific labels,
5. Awareness and attitudes towards health, resources, and environmental issues, and
6. Awareness and attitudes towards existing product performance and quality labels.

The ultimate goal of this research is to identify a label design that is most effective at influencing consumers to purchase improved and more efficient cookstoves.

The study was performed by Kantar Public (a social research private organization), and included both qualitative mini focus groups, and quantitative surveys administered in the consumer's home, in person. The focus groups and household surveys were administered to a representative sample of the adult population aged 18 and older who are considered heads of their households. The sample was drawn from three regions across Ghana, Ashanti Region, Greater Accra Region, and Western Region, and consisted of 384 interviews. Multiple draft labels were presented to participants to stimulate conversation and responses.

TIER-SETTING

The second component of this project aimed to provide technical analysis for setting thermal efficiency and emission levels for each tier of the proposed cookstove label. Developing appropriate performance levels for energy efficiency labeling programs is a robust data-driven process with market data collection and technical analysis. The performance levels for each tier for the label should be set based on the energy saved, the cost effectiveness, and the acceptability to consumers of incremental costs. The draft performance levels will go through multiple rounds of reviews by stakeholders before being finalized. The overall objective is to encourage the market transformation towards high-efficiency products in a cost-effective manner and to maximize national level energy saving impacts.

The cookstove market in Ghana is fairly nascent and readily available market data is limited. Resources for carrying out in-depth market data collection and technical analysis are also limited. As such, the objective for this tier-setting process is to use a simplified approach to develop an initial set of levels, as a first step to a longer-term and iterative process that aligns the tiers/levels with a comparative labeling program. This approach leverages existing international tier levels and international cookstove performance data. The proposed performance levels for each tier are meant to provide a starting point for the Ghana cookstove labeling program.

The specific objectives of the tier-setting are as follows:

- Define label scope – whether the label should apply to a specific cookstove type (i.e. technology-specific) or all cookstove types including biomass, LGP and ethanol cookstoves (i.e. technology-neutral);
- Set appropriate thermal efficiency levels for the label;
- Set appropriate emission levels for the label.

What we learned and recommended

CONSUMER RESEARCH AND LABEL DESIGN

Preliminary results from the qualitative portion of the consumer research provided insights into the following topics/areas of interest (from the original list above), which are summarize in Table 1.

TIER-SETTING

Defining the Label Scope

Cookstoves are a very complex product category from a standards and labeling perspective, due to the wide range of different technologies and fuel types. As such, one of the key questions to consider is whether to apply one label that is applicable across all technologies and fuels (technology-neutral approach) or different labels for each stove technology and/or fuel (technology-specific approach). It is recommended that the Ghana

Table 1. Preliminary results from qualitative interviews.

Topic	Preliminary Results from Participants/Consumers
3. Understanding of cookstove performance	When presented with the draft cookstove label, responses indicated a low association between the number of stars on the cookstove label and energy efficiency of the labeled cookstove. Participants associated the number of stars with product quality. Text on the label was largely not read.
5. Awareness and attitudes towards health, resources, and environmental issues	When presented with the draft cookstove label, most participants have not understood the concept of energy efficiency. The commonest meaning associated with the stars is service quality, similar to ratings for hotels, restaurants etc. Participants also associate the number of stars with the degree of patronage or "likes" for that product.
6. Awareness and attitudes towards existing product performance and quality labels	When asked about existing performance labels (for ACs), most participants have not associated the number of stars with "energy efficiency". Participants indicated that most of their purchasing decisions for electrical appliances are driven by recommendations from users or clear demonstration by marketers on how the gadget performs. Participants indicated that information on energy labels did not significantly drive their decisions or influence attitudes around the choice of electric appliances.

cookstove labeling program should adopt the technology-neutral approach and include all technology and fuel types, such as wood, charcoal, LPG and ethanol stoves. The following is a summary of advantages of using a technology-neutral labeling approach for cookstoves:

- **Potential to influence large segment of urban households to switch to LPG**: Over 1.7 million urban households have access to LPG but the market share of LPG stoves is only 20%[4]. A labeling program that includes LPG stoves may potentially have a huge impact on encouraging consumers to switch to LPG or other clean fuel stoves.
- **Simplicity of implementation**: Using one label facilitates monitoring and implementation.
- **Ease of understanding**: Communication campaigns are simplified, as consumers need only understand one common label that encompasses stoves using different technologies and fuels.
- **Market impacts will match program intentions**: This approach will encourage consumers to move to more efficient stoves.
- **Level playing field for manufacturers**: All products that deliver the same service (in this case cooking service) can be compared directly against each other using the same metrics.
- **Clear market signal**: This approach sends a clear market signal that more efficient technologies are encouraged and higher efficiency products will be rewarded with higher tiers on the label.
- **Enhance competitiveness of clean technologies**: Clean cookstove manufacturers or distributors gain a competitive edge, distinguishing themselves from their competitors.
- **Marketing and branding**: The technology-neutral label approach establishes the legitimacy of energy efficiency (and emissions) and allows clean cookstove manufacturers or distributors to better market and brand their products against those lower efficiency products.

Setting Appropriate Thermal Efficiency Levels

One of the most common indicators to measure stove performance is thermal efficiency, which refers to the fraction of heat produced by the fuel that made it directly to the water in the pot. A higher thermal efficiency indicates a better efficiency to transfer the heat produced into the pot.

The following resources and data were used as inputs to set the thermal efficiency tiers:

- Unofficial international tiers of performance for cookstoves;
- Draft Ghana biomass cookstove standards *DGS 1112:2015;*
- Analysis of global aggregated cookstove performance datasets[5];
- Summary of current technology and product performance available on the market in Ghana.

Additional data would be helpful but was not available (indicated in the Conclusion below).

Table 2 presents the proposed thermal efficiency levels for each tier of the Ghana cookstove labeling program at this time, based on the current technology available on the market. Importantly, these tiers/stars should be adjusted in response to market changes in said product performance availability.

Due to limited availability of Ghana-specific data, global data were used, under the assumption that the cookstove market in Ghana may have similar characteristics as the global market. Ideally, however, more accurate and Ghana-specific data

4. Global Alliance for Clean Cookstoves. (2012). Ghana Market Assessment – Sector Mapping.

5. The data primarily consisted of the Test Results Database and Stove Database from the Clean Cooking Catalog, and complemented by performance and test data from a few other studies.

Table 2. Proposed thermal efficiency levels for each of the label's star levels.

Star	Thermal Efficiency	Note
Five Star	≥50 %	Five Star can only be achieved by LPG, or other clean fuel stoves (e.g. ethanol)
Four Star	≥40 %	Four Star can be achieved by LPG or ethanol fuel stoves and also some high efficiency charcoal or wood stoves
Three Star	≥30 %	Two Star and Three Star can be achieved by many improved charcoal and wood stoves available on the Ghana market
Two Star	≥20 %	
One Star	≥10 %	One star

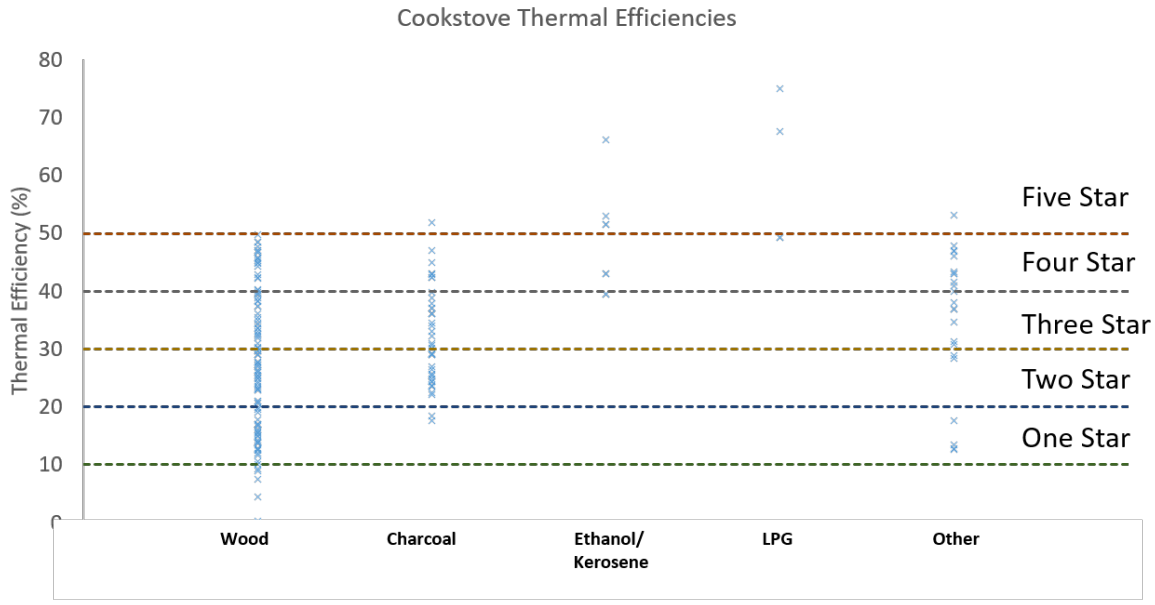

Figure 1. Cookstove thermal efficiencies.

should be collected in the future to evaluate the appropriateness of the proposed tier requirements.

Figure 1 illustrates the potential impact of the proposed tiers on the cookstove market. Any product with below One Star performance level (approximately 23 % of all products) will not be able to participate in the labeling program. The proposed tiers can provide a reasonable distinction between various cookstove technologies and therefore encouraging the market to shift towards higher efficiencies.

Setting Appropriate Emissions Levels

There are key differences in the process of setting tiers for thermal efficiency and emissions. Emissions are relevant to health risks rather than energy savings, and unlike energy efficiency and energy savings, the relationship between emissions and health risk is not linear. This means incremental improvements in the emissions levels of cookstoves do not result in proportional reductions in health risks. Therefore, using a market-based approach and an even range of tiers (both used to set thermal efficiency tier levels) may not be appropriate for setting emission tiers. Given the complexity of the relationship between emissions and health risks, it is recommended that the Ghanaian policy makers follow the approach informed by international bodies, such as WHO or ISO. Current international practice uses the following specifications for emission tiers detailed in Table 3.

Given high levels of variability in current emissions testing worldwide, it is recommended that Ghanaian policy makers use a voluntary endorsement approach for labeling emissions. Tier 2 emissions (i.e. PM2.5 < 137 mg/MJD and CO < 11 g/MJD) are being considered as the minimum threshold for the voluntary emission label – the shaded area in Figure 2 – which only a small portion of the best-performing stoves can meet.

Conclusion

Given the nascence of the improved cookstove industry in Ghana, a national standards and labeling program as well as other quality assurance initiatives offer opportunities to move consumers towards cleaner cooking methods. Preliminary results from consumer research indicate that consumers believe cookstove labels can help them make informed decisions but may be limited due to consumer's low confidence in product "endorsements" because of high rates of counterfeiting. Anti-counterfeiting measures and labels designed with minimal reliance on text to communicate messages should be considered.

Table 3. Specifications for emission tiers used by current international practice.

Tier	PM2.5			CO	
	RR	mg/MJd	Normalized Emission Rate (mg/min)	g/MJd	Normalized Emission Rate (g/min)
Tier 4	1.0	5	0.23	3	0.16
Tier 3	1.5	68	3.1	8	0.35
Tier 2	2.0	137	6.3	11	0.50
Tier 1	3.0	513	23.5	16	0.73
Tier 0	>3.0	>513	>23.5	>16	>0.73

RR: relative risk; MJD: mega joules delivered.

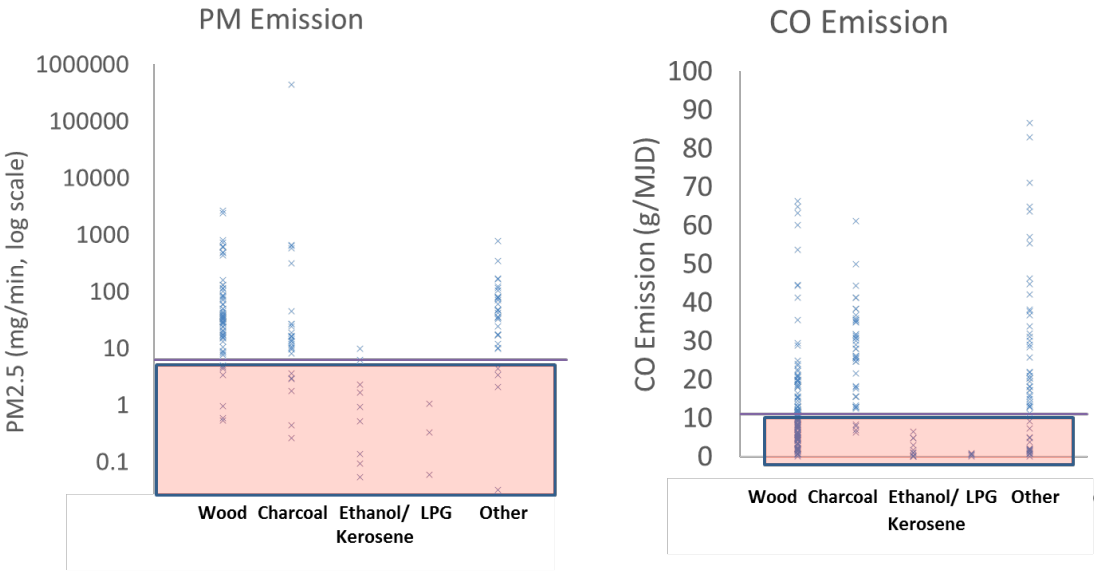

Figure 2. Proposed emissions levels.

In addition, consumer awareness of the concept of energy efficiency, and subsequent fuel and cost savings, appears low and any label may therefore require significant consumer awareness campaigns to optimize.

A technology-neutral approach to labeling cookstoves, one that includes all fuels types, is recommended due to the complexity and diversity of technologies on the cookstoves market. Final tier levels and minimum performance levels for thermal efficiency and emissions will be decided during the S&L process lead by the Energy Commission of Ghana.

Regarding opportunities for future initiatives, there is a critical need for more performance data at the country level for both thermal efficiency and emissions. Country-specific data is crucial for developing an S&L program, and the underlying labeling tiers, to transform effectively the Ghana market. In addition, continued efforts to build technical capacity of testing centers and improve accuracy of emissions testing will enhance the impact of comparative (tiered) labels, which in theory can help move consumers toward higher and higher performing cookstoves.