Quantifying and measuring climate, health and gender co-benefits from clean cooking interventions

August 6th, 2020
Project activities: Field Study on Quantifying and Measuring Climate, Health and Gender Co-Benefits from Clean Cooking Interventions

• Select project implementer
• Review methodologies
• Design field study to tech methodologies
• Test methods with field study
• Report results and recommendations
Implementing partner selection

• Competitive process:
  • Technology considerations
    • Low emissions fuel/stove technology (Tier 3 emissions or better)
    • Safe and durable
  • Programmatic considerations
    • Meet household cooking needs (high potential for displacement of traditional stoves)
    • Sustainable fuel supply
    • Focus on SSA
• 13 applicants
Selected partner

Manufactures, sells, installs and provides financing for biodigester systems for small and medium-scale farmers.

A choice of one or two burner stoves included in biodigester package.

2019 Ashden Award winner
# Methodology review

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>PURPOSE</th>
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</thead>
<tbody>
<tr>
<td>Cost Effectiveness</td>
<td>While the chosen methodologies and approaches will be robust and have environmental integrity embedded in their design, profitability for practitioners and users will be essential to their usefulness. Among others, the key determining factors of their cost-effectiveness include: (i) monitoring requirements, such as field or lab-based testing, surveys, and minimum sample size, and (ii) enabling infrastructure, including any needed monitoring expertise, availability of testing facilities across geographies, monitoring equipment costs, and other resources.</td>
</tr>
<tr>
<td>Scalability</td>
<td>Methodologies and approaches will be assessed for their potential to help projects and programs scale-up effectively.</td>
</tr>
<tr>
<td>Replicability</td>
<td>The reference methodologies and approaches should be replicable. Projects in different geographies, of different scales, and using a range of ECCH interventions should all be able to use these methodologies.</td>
</tr>
<tr>
<td>Robustness</td>
<td>The methodologies and approaches will be assessed for robustness for quantification and verification of the impact and whether they have been developed in consultation with a wide variety of stakeholders, including subject experts.</td>
</tr>
<tr>
<td>Compatibility</td>
<td>Ideally, application of the methodology should be compatible with methods for verifying other impacts.</td>
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<tr>
<td>Operational Feasibility</td>
<td>The operational feasibility of bringing the methodologies and approaches up to scale will be assessed.</td>
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Climate impacts (short-term)

The Gold Standard methodology “Quantification of climate-related emission reductions of Black Carbon and Co-emitted Species due to the replacement of less efficient cookstoves with improved efficiency cookstoves”
Factors affecting the warming impact from aerosol emissions

Emission factors for BC and OC

Displacing traditional stoves with new stoves changes:

and fuel consumption

Other factors impacting climate forcing: Extent of displacement, geography, weather, modeling assumptions, co-emitted pollutants, brown carbon, fuel renewability, etc...
Factors affecting the warming impact from aerosol emissions

Components of the standard carbon methodology
- Displacing traditional stoves with new stoves changes:
- and fuel consumption

Components specific to black carbon methodology
- Emission factors for BC and OC

Other factors impacting climate forcing: Extent of displacement, geography, weather, modeling assumptions, co-emitted pollutants, brown carbon, fuel renewability, etc...
Methods for estimating emission factors

• Current: measure in the field (expensive/technical), or laboratory (accurate?) and adjust if needed based on a sample of simple concentration measurements.

• Recommendation for alternative approach: Use literature values from recent field studies (not available at time of original methodology development).

• We will compare the results of using both approaches.

• Use of technology-specific defaults could result in less-expensive monitoring and more accurate results
Health Methodologies
Dr. Sumi Mehta
Despite widespread interest, only one methodology (Gold Standard) applied to date

**Approach:** estimate averted illness and death expected from reduced air pollution exposure

- Population parameters
- Changes in exposure
- Intervention effectiveness

**Averted illness and death**
Methodology uses HAPIT tool to estimate impacts
https://householdenergy.shinyapps.io/hapit3/
Lao PDR Case Study

Averted burden of disease calculated assuming PM$_{2.5}$ exposure reduced from 119 to 77 ug/m$^3$ in 25,000 households, no stacking, 3-year stove lifetime, and 75% usage.

LAO PDR Case Study: Summary of Recommendations, by Phase

<table>
<thead>
<tr>
<th>Phase I: Planning</th>
<th>Phase II: Validation</th>
<th>Phase III: Verification</th>
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</thead>
</table>
| **Step 1:** Set community expectations  
  - Work with community leaders to establish appropriate dissemination methods  
  - Ascertain willingness to forego the revenue from aDALYs sold in exchange for lower cost interventions | **Step 3:** Pre-dissemination monitoring  
  - Household surveys  
  - Measurements of personal exposure, kitchen air pollution (KAP), stove use monitoring, and ambient air pollution (AAP), if applicable | **Step 7:** Health investment verification  
  - If potential health benefits are sufficient (per validation), apply for aDALY credits for existing or new dissemination  
  - Demonstrate exposure reductions over time per verification protocol  
  - Sampling should include personal exposure in households with and without intervention  
  - First verification at 6 or 12 months, annually thereafter |
| **Step 2:** Make clean cooking system choices  
  - Interventions chosen should match local cooking patterns and fuel availability  
  - For advanced biomass stoves, high-quality independent lab tests should be conducted in addition to usage, stacking, and durability field studies  
  - Field fuel efficiency assessment recommended | **Step 4:** Stove dissemination  
  - Encouraging replacement of traditional stoves and proper usage of intervention stove | |
| **Step 5:** Post-dissemination monitoring  
  - Repeat measurements in Step 3 to establish impacts of the intervention stove | **Step 6:** Evaluation of exposure and health changes  
  - Determine personal exposure changes for cooks and stove usage trends  
  - Assess any changes in AAP  
  - Run HAPIT model to estimate potential health changes and averted DALYs | |

**Months:**  
- Phase I: Planning  
  - Months: 1-2  
- Phase II: Validation  
  - Months: 3-4  
- Phase III: Verification  
  - Month 6 or 12, then annually
How Could Other Methodologies Be Applied to Measure Health Benefits of Clean Cooking Interventions?

<table>
<thead>
<tr>
<th>Application Methodology Framework</th>
<th>Example of Application</th>
<th>Example of Application for ECCH Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>W+ health method</td>
<td>One project on food, fuel, and livelihoods includes focus on health benefits of no pesticide, clean water (nothing on air pollution)</td>
<td>Self-reported general health and problems due to air pollution (indoor and outdoor)</td>
</tr>
<tr>
<td>Reductions in personal exposure to PM$_{2.5}$</td>
<td>Health impact assessments for air pollution</td>
<td>Reductions in personal exposure to PM$_{2.5}$</td>
</tr>
<tr>
<td>Measures consistent with health sector and health systems performance</td>
<td>Increased use and quality of health services received</td>
<td>N/A: Measures are too distal from intervention</td>
</tr>
<tr>
<td>Measurement of change in health expenses</td>
<td>Water and sanitation interventions</td>
<td>Reduced household energy-related health expenditures</td>
</tr>
<tr>
<td>Measurement of direct health outcomes or changes in health-seeking behavior (health care facility-based measures)</td>
<td>Number of children immunized; number of women receiving antenatal care visits</td>
<td>Reduced visits to health care facility for respiratory illness; improved lung function</td>
</tr>
<tr>
<td>Self-reported health indicators and outcomes (based on validated questions, e.g., DHS)</td>
<td>Reduced diarrheal disease associated with improved water and sanitation</td>
<td>Reduced respiratory illness in young children</td>
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ADALYs methodology is resource intensive but remains the best option at present.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>ADALYs methodology</th>
<th>Personal exposure to PM$_{2.5}$</th>
<th>Measures consistent with health sector / health systems performance</th>
<th>Measurement of change in health expenses</th>
<th>Measurement of direct health outcomes / changes</th>
<th>Self-reported health indicators and outcomes</th>
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<tr>
<td>Cost-effectiveness</td>
<td>resource intensive</td>
<td>resource intensive</td>
<td>depends on the current capacity of the health system → can be cost-prohibitive</td>
<td>Inexpensive on a per household basis.</td>
<td>depends on the current capacity of the health system</td>
<td>inexpensive on a per household basis</td>
</tr>
<tr>
<td>Scalability</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Replicability</td>
<td>Yes</td>
<td>Yes</td>
<td>Possibly</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Robustness</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Compatibility</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Operational feasibility</td>
<td>best option at present → integrates exposure with epidemiologic evidence</td>
<td>most accurate risk indicator, but inconsistent with conventional health sector outcomes</td>
<td>not relevant to this sector</td>
<td>only feasible at an extremely large scale</td>
<td>only feasible at extremely large scale</td>
<td>unreliable measures, results highly influenced by external factors which are difficult to predict and quantify</td>
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Overarching goal

To improve the evidence base on the gendered dynamics of adoption of cleaner cookstoves:

• are there identifiable gender specific co-benefits?

• more specifically, can adoption of cleaner cookstoves contribute to/enhance gender equality & women’s empowerment?
An audacious leap!

Common premise of established methodologies and literature: gender co-benefits and women’s empowerment might be leveraged by,

- time savings (relieving time poverty)
- reduction in drudgery associated with traditional cooking (primarily fuelwood collection)

Foundational proposition:
the improved cookstove might be an “index intervention” that produces time savings, which in turn, may enable and catalyze women’s empowerment and gender equality
Established conceptual and methodological frameworks

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<th>METHODOLOGY</th>
<th>METHODOLOGY TYPE</th>
<th>ASSESSMENT APPROACH</th>
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<tr>
<td>Women Organizing for Change in Agriculture and Natural Resource Management (WOCAN)/ W+ methods</td>
<td>Framework &amp; Measurement</td>
<td>Survey algorithm to convert measured results and outcomes to women’s empowerment “credits” Requirements and guidelines to enable the design of project-specific monitoring and a quantification approach for gender claims</td>
</tr>
<tr>
<td>Gold Standard Gender Equality Requirements and Guidelines</td>
<td>Framework</td>
<td>Survey and other methods Requirements and guidelines to enable the design of project-specific monitoring and a quantification approach for gender claims</td>
</tr>
<tr>
<td>Clean Cooking Alliance and International Centre for Research on Women (ICRW) Social Measurement Impact System</td>
<td>Measurement &amp; Framework</td>
<td>Survey by phone and/or in person Customized survey templates for both cookstove and fuel value chain and end users</td>
</tr>
<tr>
<td>The Women’s Empowerment in Agriculture Index (WEAI)</td>
<td>Measurement index</td>
<td>Survey and provision for time diary</td>
</tr>
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</table>
Mixed methods approach

Time saved:
quantitative/time trackers; qualitative self-reporting and survey

“So what?” of time savings and satisfaction (how women do or could use their time, probing for links to empowerment opportunities):
qualitative semi-structured interviews, focus groups
Reduction of “drudgery”:
qualitative, semi-structured interviews, focus groups

Current state and changes to gendered dynamics of cooking and cooking technology:
qualitative, semi-structured interviews, focus groups
Contributions

• expand the currently thin field-based evidence base on gender co-benefits of improved cookstoves

• establish a foundation for specifically empowerment-focused longitudinal studies
Contributions

• engage with complexities of the global clean-cookstoves gender agenda:
  problem and priority definition;
  contradictions in foregrounding improved domestic appliances as a pathway to women’s empowerment;
  global investor monetization of women’s unpaid labor as a solution for global problems.
Next steps
Dr. Michael Johnson
Field Testing

Aim: demonstrate the measurement and quantification process of the three co-benefits applying the methodologies and recommendations from the review process.
Thank you