Energy for Sustainable Development 24 (2015) 33–43

Contents lists available at ScienceDirect

Energy for Sustainable Development

Complexities and challenges in the emerging cookstove carbon market in India

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ARTICLE INFO

Article history:
Received 29 January 2014
Revised 26 November 2014
Accepted 29 November 2014
Available online 20 December 2014

Keywords:
Cookstoves
Carbon finance
India

ABSTRACT

"Improved" cooking technologies have been generally understood to be a "win–win" development intervention creating both environmental and development benefits. Yet dissemination of improved cooking technologies has faced many challenges. Carbon finance provides an opportunity to address some of the financial barriers in dissemination initiatives. However, the impacts of carbon finance on cookstove activities are not fully understood. Using India as a case study, this research examines how carbon financing is impacting cookstove dissemination efforts. Specifically this study identifies which actors in the Indian cookstove arena are engaged in carbon financed initiatives and how this is changing their business models and for those not applying for carbon finance, what their rational for this choice is. Results based on 19 semi-structured interviews provide an overview of different organizational approaches employed, perceptions around carbon financing, and identification of the opportunities, challenges and unknowns surrounding the use of carbon finance for cookstove dissemination.
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Introduction

The use of inefficient, polluting cookstoves located mostly in developing countries has resulted in large-scale impacts on social welfare (e.g., global health), local environments and climate change. Three billion people worldwide still rely on some form of solid fuels (i.e., traditional biomass and coal) to meet their cooking and heating needs (Legros et al., 2009). This results in approximately four million annual premature deaths attributed to the effects of household air pollution (including both indoor and outdoor emissions from cookstove use) (Lim et al., 2012) with 53% global woody biomass harvested used for wood fuel (FAOSTAT, 2013). Furthermore, cookstoves are significant emitters of black carbon, a climate forcing species recently recognized to be second only to carbon dioxide. Up to 80% of black carbon emissions in Africa and Asia are the result of residential solid fuel use (Bond et al., 2013). Switching from less efficient stoves to cleaner burning, more efficient stoves therefore has great potential to create both environmental and social benefits. This recognition has resulted in many initiatives to disseminate various forms of improved stoves globally.

Despite many efforts implemented through different dissemination channels over the last 40 or more years, more than 40% of the global population still uses solid fuels. Of those, more than two thirds do not use an improved stove (Legros et al., 2009). The failure to achieve wide-spread dissemination of such technologies has been attributed to many different barriers of diffusion including failure to meet users' needs (Barnes et al., 1993), challenges with distribution supply chains, and high technology and distribution costs relative to the low-income households who could benefit from such technologies the most (Zerriffi, 2011; Shrimali et al., 2011; Rehfuess et al., 2013). Carbon financing has been proposed to address one of the existing diffusion barriers, generating the additional financing needed to provide stoves at affordable, subsidized costs for targeted end users while allowing for sustainable business models. Based upon these potential benefits, applying for carbon finance has become increasingly popular for cookstove projects (Blunck et al., 2011; Shrimali et al., 2011; Peters-Stanley and Yin, 2013). Furthermore, the perceived development value of cookstoves has resulted in these projects earning the highest average price per credit per project type in the voluntary market both in 2011 (Peters-Stanley and Hamilton, 2012) and 2012 (Peters-Stanley and Yin, 2013). However, there is still much uncertainty around credit prices with an average 15% price decrease observed between the two years (Peters-Stanley and Yin, 2013).

Overall such a model has yet to prove its long-term sustainability as the first cookstove project was registered in 2007 (Peters-Stanley and Yin, 2013), with the crediting period usually lasting over a period of seven–ten years[1] (Blunck et al., 2011; The Gold Standard, 2008). There is also limited research around the impacts of carbon financing on the cookstove business models themselves, this being the focus of this

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[1] Both the CDM and GS follow the allowable standard UNFCCC crediting period. This allows for projects to be designed around fixed or renewable time periods. A seven-year renewable project period can be chosen and renewed up to two times resulting in a maximum of 21 years. Or a 10-year fixed project time line can be used with the project being terminating at the end of the 10 years (UNFCCC, 2013a; The Gold Standard, 2008).

http://dx.doi.org/10.1016/j.esd.2014.11.004
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study. A few studies have looked at tradeoffs between different benefits of carbon financed cookstove projects and their potential implications (Simon et al., 2012; Freeman, 2012; Freeman and Zerriffi, 2012; Freeman and Zerriffi, accepted for publication), with others focusing on commercialization efforts and business models for cookstove dissemination (Shrimali et al., 2011; Zerriffi, 2011; Bailis et al., 2009). Yet there hasn't been any peer-reviewed published works comprehensively examining the way carbon financing is changing approaches for cookstove dissemination for multiple types of organizations at the country scale. To better understand its potential role in dissemination models, this study examines how carbon financing is changing the cookstove industry. India was chosen as a study location because 1) it demonstrates extensive potential to benefit from such improved technologies and 2) it is home to a number of past and present cookstove dissemination efforts. This study specifically aims to identify what kind of organizations are choosing to apply for carbon finance for cookstove projects, what their main motivations are and how this is changing the way they are doing business. Similarly for cookstove organizations choosing not to apply for carbon financing, the rationale for this choice, effectiveness of their current business models and their perceptions of carbon finance were explored. Specifically this study addresses the following research questions:

1. What are the perceptions around the benefit and barriers of carbon finance for organizations disseminating cookstoves?
2. How is carbon financing changing the way of doing business or operating as an organization?
3. What are other strategies cookstove organizations are taking to promote cookstove dissemination in addition to carbon finance?

The results of this research outlines a general picture of how carbon finance is being applied within a range of different organizations in India and provides insight into the potential benefits, challenges and uncertainties surrounding the use of carbon finance as a tool for cookstove dissemination.

Background

Challenges in dissemination

Cookstoves can provide a range of benefits including improved health conditions resulting from the reduction of household air pollution (Bruce et al., 2000; Smith and Mehta, 2003; Rehfuess, 2006), reduced demand for fuel sources (often woody biomass) (Barnes et al., 1993; Rehfuess, 2006), reduction of climate warming species emitted (Bond et al., 2004; Smith and Haigler, 2008; Grieshop et al., 2011), empowerment of women (Rehfuess, 2006; Parikh, 2011) and savings in time and/or money dependent upon whether the fuel is collected or purchased (Barnes et al., 1993; Hutton et al., 2006; Rehfuess, 2006). Based upon the many potential benefits and relative low cost of the intervention (Rehfuess, 2006), many initiatives to disseminate different improved cookstove models, mostly in developing countries, have occurred globally. Still such efforts have been challenged in generating long-term, wide-scale uptake (Zerriffi, 2011).

In the 1970s improved cookstove projects started to gain international traction with concerns about energy scarcity and pressures on wood fuel resources (Barnes et al., 1993). Since then many different cookstove related programs and initiatives have occurred with a shift in focus of such programs to address sustainable development through the creation of both environmental and social benefits (Bailis et al., 2005; Hutton et al., 2006; Smith and Haigler, 2008; Simon et al., 2012). Most efforts thus far have been implemented through non-governmental organization (NGO) and governmental channels. With the exception of the Chinese national program neither have been successful at achieving wide-scale lasting uptake of improved cooking technologies (Shrimali et al., 2011). Only 838 million people worldwide, two thirds of whom are in China, have access to some form of improved cookstove compared to the 3 billion still using some form of solid fuels to meet their cooking and heating needs (Legros et al., 2009). Dissemination through NGOs has been restricted in scale due to limited human and resource capacities (Edwards and Hulme, 1992; Uvin et al., 2000; Shrimali et al., 2011). Though some governmental programs have achieved significant scale of dissemination it often has not resulted in long-term uptake of the technology as in the case of the Indian National Program for Improved Chulas[2] (NPIC; Kishore and Ramana, 2002; Hanbar and Karve, 2002). Dissemination challenges for NGOs were related to inappropriate choice of technology which did not fit users' needs, limits in scale and funding, lack of infrastructure to provide after-sale services such as maintenance and replacement options, and neglect to create the necessary awareness to generate end user value for the new technologies (Bansal et al., 2013). Furthermore the promised benefits of such new and "improved" technologies, in practice often fell short. There were a number of instances where the stoves did not in fact reduce emissions and/or fuel (Kshirsagar and Kalamkar, 2014). In part, this was due to performance in the field being vastly different from the lab as well as stove durability being limited in many cases (Kshirsagar and Kalamkar, 2014).

Due to the disappointing outcomes of such initiatives, a number of different market-based approaches have recently been emerging. Though many are fairly young, challenges in achieving both widespread dissemination and financial sustainability have been identified (Shrimali et al., 2011; Kowsari, 2013; Zerriffi, 2011). Much of the challenge lies in targeting low to lower-income consumers in tandem with the need to create a new commercial market (Zerriffi, 2011; Shrimali et al., 2011; Kowsari, 2013). Though different companies have different stove models targeting different consumers, including the middle-income bracket, in general, cookstoves are a commodity with lower than normal profit margins requiring large scales to generate significant returns. Commercial entities face additional challenges including needing to create a market for a commodity which in its traditional forms is usually available at a fraction of the cost, limits to available start-up financing with many financial institutions wary of providing loans to a company with a product generating such low margins of return, and creating functioning cost-effective distribution channels for both sales and after-sale services (Kowsari, 2013; Zerriffi, 2011; Rehfuess et al., 2013).

A new tool: carbon finance

The financial gap between the cost of improved cooking options and the willingness or ability to pay of lower income households, combined with the climate effects of inefficient burning of solid fuels, provides an opportunity to use carbon finance to bridge that gap. There are two ways cookstoves have climate impacts. First is based upon reducing their direct emissions (including short-lived particles of incomplete combustion, i.e., black carbon) through increased combustion efficiency[3] and second through the reduced consumption of non-renewably sourced fuel (e.g., woody biomass harvested at a rate exceeding the rate of regeneration). In principle, reducing climate impacts either way should generate carbon credits that can be used to offset emissions being emitted elsewhere. In practice, most of the carbon credits calculated are through the latter source with many direct emissions either not included in calculations at all or accounting for only a limited set of climate forcing species (Freeman and Zerriffi, accepted for publication).

Carbon finance is generated through registering emission-offsetting projects. Improved cookstove projects, which are defined as either energy efficiency or renewable energy projects, can qualify to become registered as an offset project generating carbon credits that can be sold in the carbon markets to buyers wishing to offset some form of emissions. These projects can be certified under either the regulated or voluntary markets. The regulated markets generate credits to be sold to buyers

[2] Chula is analogous to cookstove.
[3] See supplementary material in Jetter et al. (2012).

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