GIVING GREEN (BETA)

CARBON OFFSETS: FUEL EFFICIENT COOKSTOVES

This work is preliminary, and subject to change. Questions and comments are welcome at givinggreen@idinsight.org.

SUMMARY:
Adoption of fuel efficient cookstoves can decrease household fuel use, and therefore carbon emissions. There are a wide variety of cookstove offsets on the market, using different technologies in different contexts. Although the methodology used to certify these projects ensures that they make a reasonable case they are offsetting emissions, it also requires strong assumptions around stove use and changes in cooking behavior. The impact evaluation literature shows highly mixed results, with some Randomized Control Trials (RCTs) showing cookstoves have strong effects on fuel usage, and others showing null effects. We don’t feel comfortable recommending cookstove offsets in general, as the RCT literature shows that the required assumptions are frequently not satisfied. However, we would recommend offset projects that are very similar to those that have shown strong results in a rigorous evaluation, such as the recent work by Berkouwer and Dean (2019). For instance, the manufacturer of the cookstove studied in this RCT (BURN) sells carbon credits. Purchasing these credits is very likely to result in real emissions reduction (though it is very unlikely to map directly into the promised decrease in emissions of 1 ton of CO2 promised by the carbon credit.) You can purchase offsets generated by BURN by emailing carbon@burnmfg.com. Additionally, you can make a direct contribution to BURN here.

OUR RESEARCH PROCESS:

CONTEXT OF COOKSTOVES AS A CARBON OFFSET
In theory, clean cookstoves appear to be a good way for donors to achieve emissions reductions while also improving the lives of poor households. Many poor households in the developing world cook over an open fire, which is not energy efficient and results in household smoke. There are a myriad of improved cookstove technologies that have been developed to solve this problem, and donor funds can be used to subsidize their distribution or even give them away for free.

However, clean cookstove projects have a mixed record of success. Many have used technology that were not well-suited to local conditions, leading to stove malfunctions and limited usage. (See discussion of the literature below).

EXAMPLE OFFSET: THE GOLD STANDARD CERTIFICATION AND THE MYANMAR STOVES CAMPAIGN
In order to assess clean cookstoves offsets, we conducted a deep dive on one specific offset, the Myanmar Stoves Campaign. Although much of the following discussion is on this offset in particular, most of the conclusions should apply to all cookstove projects certified by The Gold Standard, as all projects must undergo the same certification process using the same (or similar) methods.

The Myanmar Stoves Campaign sold the Envirofit SuperSaver GL fuel efficient stove (“FES”) to rural households in Pyawambe township in central Myanmar. In this area, households traditionally cook over an open “three stone fire”. According to manufacturer specifications the FES allows households
to cook with around one third of the wood they would use for traditional cooking. The emissions credits are used in the sales efforts and provide the stoves at a subsidized price of around 7 USD. The emissions certification was coordinated by the Soneda Foundation; MercyCorps was the project implementer. The Gold Standard sells offsets from this project at a price of $15/ton.

We reviewed the certification documents posted on the Gold Standard project database to see how they calculated emissions reductions. Their calculation relies on a standard model which takes into account the baseline value of wood usage, the efficiency of the stove, and pre-determined conversion factors of wood to emissions (approved by the UN’s IPCC) to calculate the amount of emissions reductions. It also includes corrections for some human behavior elements, such as the fraction of households who continue to use the stoves after X number of years, and the fraction of cooking that continues to be conducted on the old stoves.

The model appears to take into account most elements necessary to calculate emissions reductions; however, there are a couple of strong implicit assumptions. First, it assumes that wood use would not have changed over time without the new stoves. But wood use may have decreased even without improved cookstoves due to, for instance, alternative technology or rising costs of wood. Second, it assumes that adoption of improved cookstoves do not change the demand for energy. Since the improved cookstoves drastically decrease the price of cooking, one would think that this may result in increased demand for cooking. We’ll get to further discussion of these assumptions later.

While estimates of all model parameters have to be provided and justified prior to certification, project implementers must also provide validation of certain parameters, such as human behavior elements, throughout the life of the project. In this case, the validation exercise was a household survey of 100 purchasers of the FES, conducted by a consultant hired by the Soneda foundation and MercyCorps staff. The emissions credits are not actually granted until this validation takes place and is verified through a review by Gold Standard.

The key human behavior elements are the percentage of households who are using the stove after X number of years, as well as the amount of meals prepared using the old stove. The survey found that after two years, 83% of households were still using stoves. This is well below the original estimate in the certification documents (100%) but still pretty good. They also find around 2% usage of traditional stoves alongside the improved one, which is about the same as their estimate during certification.

CONCERNS WITH THE GOLD STANDARD CERTIFICATIONS

Overall, we have three main concerns with this certification:

1. **There is no actual measurement of wood usage during verification.** While this is understandably more difficult to measure, it would provide an indication of how much wood is actually used once the stove is in use. Without this data, we have to rely on the strong assumption that energy demand stays constant even though the stove drastically decreases the price of cooking. It is hard to know for sure whether this will be a significant factor without a deeper understanding of the context, but the project documents give some worrying indications. For instance, they state that high wood usage at baseline is partially due to the fact the most households raise livestock, and use
their stoves to cook cereals for livestock feed. It seems like lower cooking costs could certainly induce households to increase their livestock holdings, therefore driving increased demand for cooking.

2. **There is no comparison group.** Without a comparison group, we must make the strong assumption that the level of wood consumption at baseline would have stayed constant in absence of the project. Again, without additional context it is hard to understand if that assumption is likely to be valid. But certainly, there are a number of mechanisms that theoretically could be in play that would invalidate this assumption. First, it is possible that farmers would have adopted other improved cooking technology that would also reduce wood use. Second, it is possible that other factors were causing wood usage to change over time. This could be, for instance, changing wood prices, changing livestock holdings, migration, etc.

3. **Verification data was collected by recipients of certification money:** the field-based verification of stove usage could give one confidence that emissions are being reduced by this project, especially since there are many examples in the literature of cookstove projects failing due to lack of household usage. However, there appears to be a major conflict of interest in the fact that the verification survey was conducted by the Soneda Foundation and MercyCorps. The results of this survey directly affect the amount of emission reduction credits that these parties can sell. As they have already proceeded with project implementation with the expectation of receiving emission credits, a negative verification result could be financially painful. Though we have no reason to doubt the honesty and veracity of data collected by these parties, there is a strong incentive for them to find data in accordance with their estimates, and therefore it is difficult to trust the results of the survey.

**THE ASSUMPTIONS BEHIND THE ESTIMATES OF COOKSTOVE EMISSIONS REDUCTIONS USED FOR CERTIFICATION DON’T ALWAYS HOLD: EVIDENCE FROM IMPACT EVALUATIONS**

Since the estimated emissions reductions require some strong assumptions to believe, do we believe these assumptions? For this, we turn to the impact evaluation literature on improved cookstoves. Fortunately, a number of high-quality RCTs on improved cooking technology have been conducted in a number of contexts. If these studies generally find that stove usage remains high and wood usage decreases in line with the increased efficiency of the stoves, that would go a long way to believing the offset assumptions.

Unfortunately, the results of these studies are very mixed. There are certainly some studies showing positive results. For instance, Bensch and Peters (2015) conduct an RCT of improved cookstoves in Senegal and indeed find large decreases in firewood usage. But they also find that 27% of meals are cooked on traditional stoves in the treatment group a year after distribution, which is much higher than the assumptions (2%) in the Myanmar stoves project. Berkouwer and Dean (2019) find that improved cookstoves in Kenya lead to decreases in fuel expenditure by 40% (which is close to the manufacturer’s claims of 50% lower fuel usage), and that these effects persist for 18 months after adoption. On the other hand, Hanna et al (2016) find no change in greenhouse gas emissions from a cookstoves project in India, primarily due to dis-adoption of the stoves. Aung et al (2013) find no
Due to the strong assumptions necessarily made in the certification process and the mixed results in the RCT literature, we don’t feel like we can confidently recommend the Myanmar Stoves Project offsets. And by extension, we don’t think we could recommend cookstove offsets certified by The Gold Standard in general. That doesn’t necessarily mean that we think these cookstove projects aren’t working. Likely most of them are having some effect on emissions, and some of them are probably having significant effects. But we think that certification from the Gold Standard is not enough to convince us that emissions reductions are happening as calculated, since they rely on too many unvalidated assumptions.

WHICH COOKSTOVE OFFSET PROJECTS DO WE RECOMMEND? THE CASE OF BURN STOVES

We would feel confident recommending offset projects that are similar to those have shown strong effects in the RCT literature. This would be especially true for projects that are similar to that studied in the Berkouwer and Dean paper. This study showed reductions in actual fuel use of a similar magnitude as predicted by the efficiency of the stove, which is a key assumption made in the offset certification that is rarely validated in the RCT literature. This study used the Burn Jikokoa charcoal-burning stove, and took place in Kenya. Can we find certified offsets for sale that fund a project with a similar stove in a similar context?

Unfortunately, that task proved to be difficult: there are a lot of clean cookstove offset projects. We attempted to scan through all the cookstove projects certified by The Gold Standard for ones that seemed sufficiently similar, but didn’t find any that fit the bill. (It is certainly possible that we missed one, as it was hard to quickly understand whether the stove and context were similar to the situation studied in the Berkouwer and Dean paper. There also could be other similar offset projects certified by different certification agencies).

Stymied by this effort, we asked Burn stoves if they knew of any projects financed by the carbon markets that used their stoves. They told me that in most cases they themselves claim the offset credit from the manufacture of Burn stoves, and sell these offsets through brokers of emission credits. However, they did admit that since the price of carbon credits is low and demand uncertain, they needed to organize their business such that it would be successful even without reliance on the emissions market. They said that the additional revenue provided by the emissions market allows them to conduct additional marketing and R+D. So there is not a direct link between buying an emission credit generated by Burn and removing 1 ton of CO₂ from the atmosphere. However, by buying their credits one is supporting a company that is producing technology that is truly emissions-reducing. As it seems very likely that having the additional revenue stream from carbon credits allows Burn to sell more stoves, we feel that this is an offset we can confidently recommend.

Unfortunately there is no point-and-click way to purchase offsets based on Burn stoves, as Burn sells its carbon credits through a broker. However, you can purchase Burn-linked offsets by emailing carbon@burnmfg.com. Additionally, you can make a direct contribution to BURN here. Purchased the offsets and making a donation have the same impact on BURN of providing an additional revenue stream. So unless the purchaser needs to show purchase of carbon credits to
achieve regulatory or PR goals, one might as well just take the simpler route of making a direct donation.

If one is looking for a more direct path between the offset purchased and carbon removed, they might look for distributors of Burn stoves. These distributors could in theory use carbon credits to directly give away (or sell at a discount) the stoves, and this would provide a tighter link between an offset purchased and carbon removed. Burn told us that there are some distributors who do have this model and generate carbon credits, but we were unable to find a way to purchase offsets through them related to Burn stoves.

REFERENCES


Berkouwer, Susanna and Joshua Dean. “Credit and attention in the adoption of profitable energy efficient technologies in Kenya.” Mimeo, 2019

