Subsidise the stove, not the electricity: market distortions and clean-cooking subsidies in sub-Saharan Africa

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- A randomised trial with 2,000 households in Kenya tests how market distortions change which subsidies move households from charcoal to electric cooking, and how much carbon abatement each subsidy dollar achieves.
- Subsidising the electricity that a stove uses has no measurable effect. Cutting the price of electricity used for electric cooking by as much as 75% did not detectably change whether households bought a stove or how much they cooked with it.
- Subsidising the upfront price does work, and distortions make it work more cost-effectively. Limited access to credit and similar frictions keep high-usage households out of the market: they would benefit from the stove but cannot cover its upfront cost. That creates an opportunity for upfront subsidies to be pivotal for the households that save and abate (prevent emissions) the most. The larger the distortion, the more emissions each subsidy dollar abates.
- Subsidising electric cooking is a cheap climate policy. An adopting household cuts its energy bill by 36%. It abates about 2.5 tCO_2e/year, at a subsidy cost of roughly USD 13 /t abated—well below the cost of comparable climate measures in rich countries.
- For policy, this means subsidising the purchase rather than the kilowatt-hour, and directing that spending to where distortions are largest, which points towards low- and middle-income countries.

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A clean-cooking transition, and how to subsidise it

About 2.8 billion people still cook with polluting fuels such as charcoal and wood, at a high cost to their pocketbooks, their forests, and the climate (World Bank Group, 2020). The reliance is heaviest in sub-Saharan Africa, where roughly three-quarters of households cook with charcoal or firewood, and in Kenya, where roughly two-thirds do so (Berkouwer & Dean, 2026). At the same time, electricity access has expanded quickly across the region, and several grids are unusually clean: about 85% of Kenya's power comes from renewables, chiefly geothermal, hydro, and wind (Kenya Power, 2023). Together, these trends make electric cooking a realistic, low-carbon alternative to charcoal.

Governments have begun to act. Kenya's national utility launched its *Pika na Power* ("cook with power") programme in 2023, pairing it with VAT waivers, consumer financing, grid investment, and a discounted tariff for electric cooking (Kenya Power, 2023; Ministry of Energy and Petroleum, 2024). Uganda and Tanzania have adopted similar plans. The question is how to spend limited budgets well, and where. Our study shows that the answer depends on market distortions: the financial frictions or behavioural biases that keep households from adopting technologies that would save them money. In our experiment, we vary one such distortion (access to credit) and find that it shapes both which subsidy works and how far each subsidy dollar goes.

What we did

We ran a randomised controlled trial with about 2,000 charcoal-using households in Nakuru County, Kenya, between August and December 2025 (Berkouwer & Dean, 2025). At baseline, a typical household cooked with charcoal for three hours a day and spent about USD 16 a month on it, emitting close to five tCO_2e a year per household. We offered each household a modern induction stove on randomly varied terms. This lets us separately examine the effectiveness of two potential types of subsidies:

- an upfront subsidy on the stove's purchase price (a 10% or a 75% discount); and
- a usage-cost subsidy on the electricity the stove used (0%, 25%, or 75%), delivered automatically through Kenya's prepaid meters.

To study how distortions change the value of these subsidies, we also varied whether households could spread the purchase over time with a small loan.

This allows us to vary how severely households are credit-constrained, so that we can observe how that distortion changes the effects of different subsidies.

We measured cooking in three ways. To track charcoal use, enumerators fitted each household's charcoal stove with a sensor at baseline that recorded a temperature reading every two minutes throughout the study, from which we inferred when and for how long the household cooked. The induction stoves logged their own electricity use in kilowatt-hours and transmitted it in real time. Repeated household surveys recorded what families spent on charcoal, electricity, wood, and LPG, which we combine with monthly market-price surveys to convert spending into fuel quantities and emissions.

What we found

Electric cooking saves money and cuts emissions

Buying the stove reduced daily charcoal cooking time by 34% and monthly charcoal spending by 66%. Electricity spending rose by much less, so a household's net energy bill fell by 36%, or about USD 184 over the stove's lifetime. At the USD 82 purchase price, that is a 112% annual return. Emissions fell by about 2.5 tCO_2e per household each year; because the grid is so clean, the additional electricity added back almost nothing. However, if dirty fuels powered the grid, the stove would still abate more than 2 tCO_2e per household each year.

Subsidising electricity use has no measurable effect

Cutting the price of the electricity used by the stove had no detectable effect. It did not increase households' willingness to buy the electric stove, and even a 75% cut did not increase how much buyers used it. Each USD 1 of usage-cost subsidy increased willingness to pay by an average of one cent, and we can rule out an effect larger than 16 cents. Nor did it raise how much buyers cooked: even a 75% cut in usage costs produced no measurable increase in use.

Upfront subsidies work, and distortions make them more effective

Upfront subsidies are effective at driving adoption. Demand responds strongly to the purchase price: cutting it by three-quarters raised the share of households buying the stove from roughly one in ten to about half.

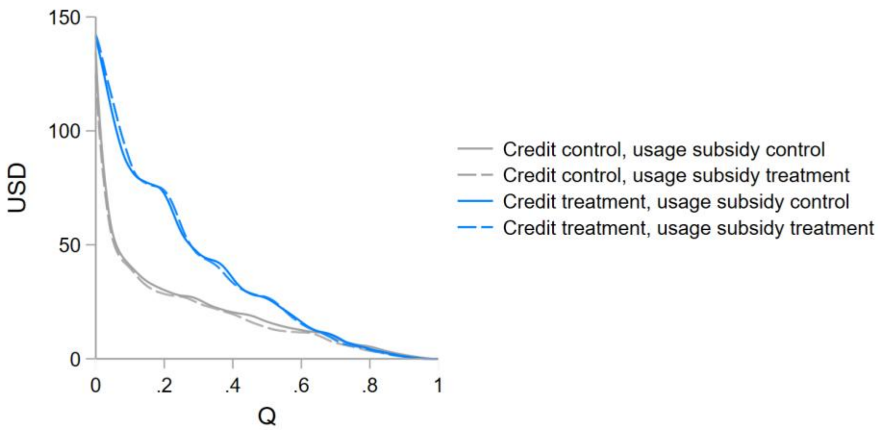
Distortions improve the cost-effectiveness of upfront subsidies in two ways. First, more of the buyers it brings in are high-usage households that the credit barrier had kept out. Those high users also abate the most. Second, because so many households are held back, demand responds sharply to a price cut, so little of the subsidy goes to households that would have paid full price anyway. Each subsidy dollar therefore abates more the tighter the constraint: relaxing it with a loan raises the cost of abatement from USD 13 /t to USD 22 /t.

An upfront subsidy works in part by easing the very constraint that holds these households back, by lowering the amount a household must pay at once. Expanding consumer credit could ease that constraint, too. However, reliable lending to low-income, largely informal households is cost-prohibitive to deliver at scale, which makes subsidising the purchase a more practical lever.

Subsidising electric cooking is a cheap climate policy

Reaching one additional buyer through an upfront subsidy costs about USD 65, and each buyer abates 2.5 tCO_2e per year for multiple years. Taken together, this puts the cost of abatement at roughly USD 13 /tCO_2e. Comparable climate measures in the United States cost far more: residential solar around USD 90 /t, appliance rebates around USD 474, and electric-vehicle subsidies over USD 1,300 (Hahn et al., 2026). Our research suggests that part of the reason for this discrepancy is market distortions. For example, in the United States, most new car purchases are made on credit. As a result, subsidies are less targeted, and abatement is more expensive. In contexts where credit markets face greater frictions, as in much of sub-Saharan Africa, the same subsidy policy goes further. Our model suggests that without any distortions, the subsidy cost of abatement would rise more than tenfold, to about USD 137 /t.

Figure 1: Credit constraints hold demand down; subsidising electricity leaves it unchanged



Note: Share of households willing to buy the electric stove at each upfront price. Within each credit group, the demand curves with and without a usage-cost (electricity) subsidy lie almost on top of one another, so subsidising electricity barely changes demand. By contrast, credit constraints sharply depress demand: households without access to loans are far less likely to buy at any given price. Source: authors' randomised trial, Nakuru County, Kenya, 2025 (Berkouwer & Dean, 2026).

Recommendations for policy

- **Subsidise the purchase, not the kilowatt-hour.** Concentrate public and donor funds on lowering the upfront cost of clean cooking devices. Usage-cost subsidies, including discounted electricity tariffs for cooking, are expensive and do little to raise adoption or use.
- **Direct subsidies to where distortions are largest.** The return to an upfront subsidy is highest among the most credit-constrained households and markets. Targeting those settings raises the emissions abated per dollar.
- **Treat clean-cooking adoption as competitive climate spending.** At about USD 13 /tCO_2e, subsidising the price of improved stoves compares well with most climate programmes and merits funding from climate and carbon finance on those terms.
- **Look to low- and middle-income countries.** Because distortions are most pervasive there, some of the cheapest abatement may lie precisely in the places where climate finance has been slowest to reach.

Implementation challenges

Several practical issues shape how far these lessons travel:

- **Targeting is harder than spending.** Directing subsidies to the most distorted households or markets requires identifying them, which is more demanding than an across-the-board discount.
- **Upfront budgets versus recurring costs.** Concentrating support at the point of sale front-loads spending, which can be harder to budget than a tariff discount, even when it costs less overall.
- **Grid capacity and tariffs.** Wider adoption adds to electricity demand, and voltage quality and reliability will shape both uptake and how much households cook.
- **Who is reached.** Our estimates describe households that already relied heavily on charcoal and held a prepaid electricity connection; effects may differ for other groups.

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