

Waste Not: Can Household Biogas Deliver Sustainable Development?

Motivation and research questions: Biogas is a technology that can provide important socioeconomic and environmental benefits, helping households move towards sustainable development. Our research studied whether biogas promoted sustainable development by reducing biomass fuel collection, shifting household time budgets or reducing loss of forest cover.

Household biogas systems produce clean fuel by converting human and animal waste into combustible gas. Biogas typically replaces wood or dung-based fuel. Nepal is a key testing ground for household biogas; systems have been promoted there through public-private partnerships for over 20 years. Biogas has been adopted by 300,000 households as of 2015 and could be suitable for more than one million more. Nepal has invested in biogas through subsidies, quality oversight, and credit facilitation, with a key coordination role played by the Alternative Energy Promotion Centre (AEPC).

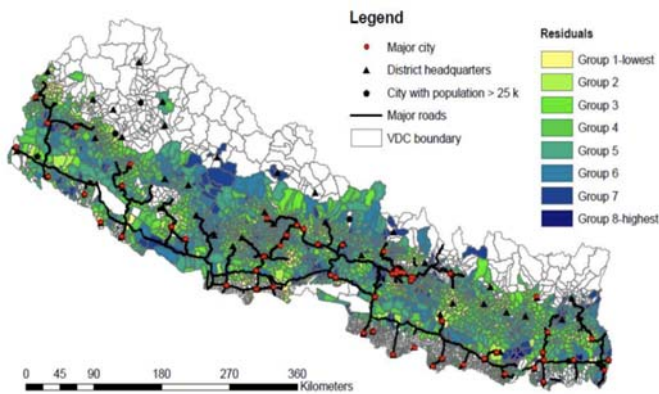


Key findings and conclusions: Biogas significantly decreased household fuelwood collection by 800-2000 kg per year and saved 23-47% of household collection time. Households decreased time allocated to wage labor and spent more time in educational studies or agriculture, particularly in the more productive Terai regions. Biogas systems reduced forest cover loss in the Hill regions and when combined with other forest protection policies. These results suggest biogas has positive impacts, but substantial shifts towards long-term sustainable development will require pairing biogas with complementary factors such as high-return labor options and forest protection policies.

Innovative methodology: It is difficult to isolate the impacts of biogas because households who adopt biomass may be different from those who don't. We provide the first instrumental variables-based evidence on the impacts of biogas, which uses a measure of access to company branches as a natural experiment to assess biogas impacts. We combine data from household surveys, remote sensing, administrative biogas expansions, and the census to study impacts between 2002 and 2012.

Variation in distance to biogas branches used to instrument for adoption

Because other factors such as access to markets closely correlate with branch location, our instrumental variables approach uses the remaining variation in branch location after controlling for other confounding factors at the VDC and household level.

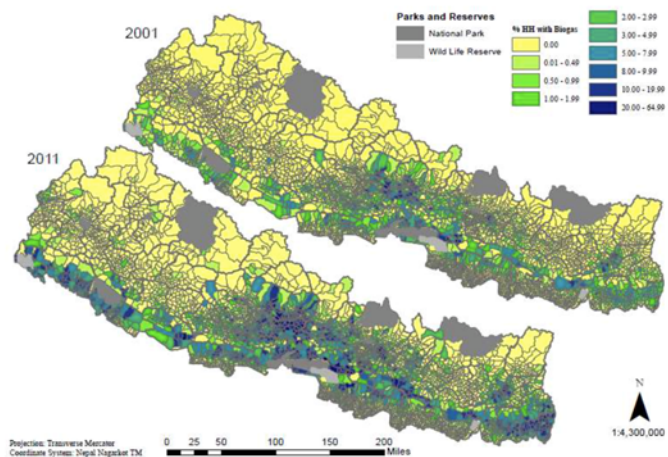


The residuals from a regression of average distance to biogas company location on all other included controls show the remaining variation in branch distance—used to predict biogas and identify impacts. Government policies and rules for new biogas branches result in high and low residuals throughout Nepal.

Percent of households with biogas installed per VDC

Nepal has had substantial increases in biogas installations at the Village Development Committee (VDC) level between 2001 and 2011. The positive impacts of household biogas found in our study suggest that it has a key role to play in transitions to sustainable development.

Figure 1. Percent of households with biogas installed per VDC



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