Monitoring for Impact:
The case for a digital approach to biodigester performance optimisation

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The remote monitoring of biodigesters – for example through smart monitoring devices such as Smart Biogas – is attracting growing interest from practitioners and investors for its ability to unlock transparent, higher-value carbon credits in the voluntary market. However, the remote monitoring of biogas also unlocks a huge opportunity for improving biodigester performance: by tracking gas consumption, leakage, and venting, Smart Biogas makes the information required for delivering the best value to users readily accessible.

Biodigesters are "live systems", as such they are not straightforward to manage. Users often require support to look after their digesters and use them optimally. To this day, there has been a tendency in the sector to adopt a "fit & forget" attitude – both with regard to biodigesters and smart meters. This leaves the optimisation opportunity untapped, with negative consequences for the environmental credentials of the sector as well as for users' trust of the biogas technology and overall experience.

Inclusive Energy believes in an "active monitoring" approach to biogas usage optimisation and has been putting it to test through a series of pilots. This report presents the findings from a first pilot, which took place in Bihar, India, in 2022. The findings validate the merit of the "active monitoring" approach to biogas usage optimisation and attest to the promise of the digital pathway to impact.

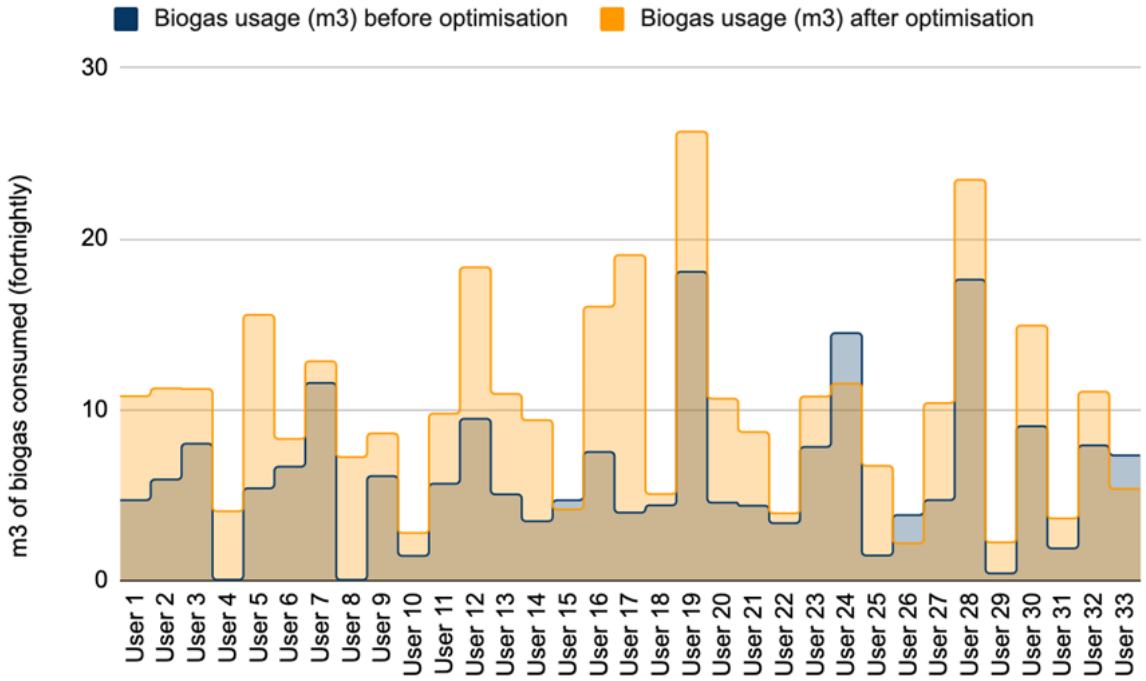
A case study from Bihar, India
Methodology

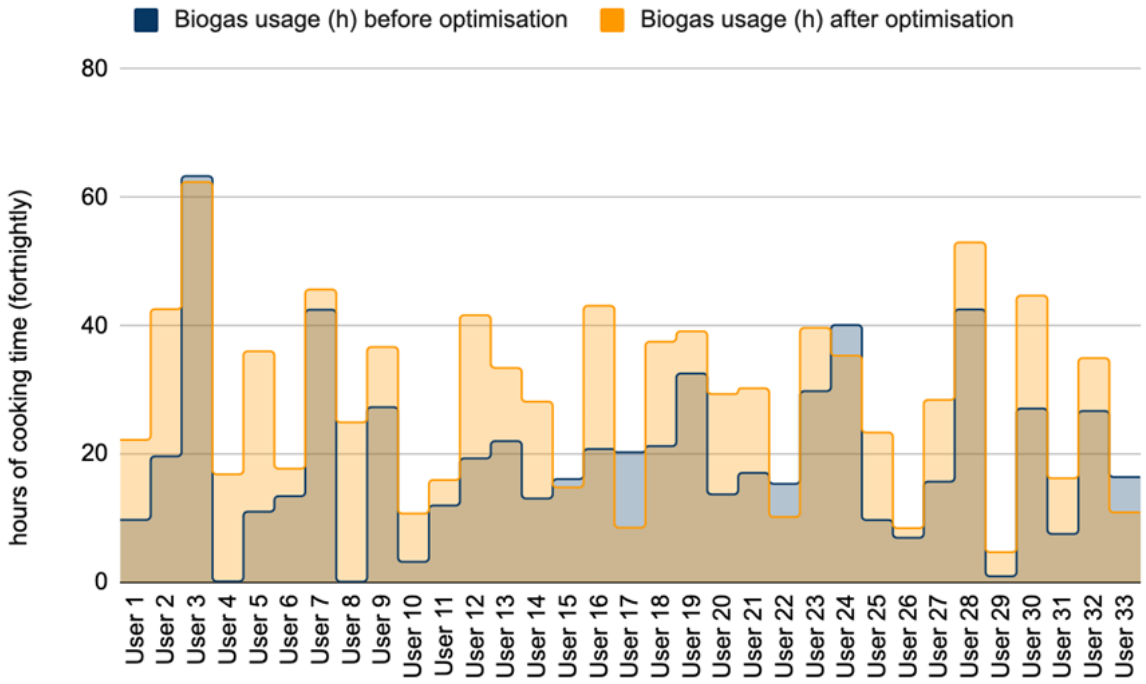
In 2020, the National Dairy Development Board (NDDB) established small-scale biodigesters with 100 farmers from the Barauni Milk Union in Bihar, India, as part of the New National Biogas and Organic Manure Programme (NNBOMP). In December 2021, Inclusive Energy's Smart Biogas meters were installed to monitor the health and performance of biodigesters, giving insights into technical as well as behavioural aspects (such as feeding and gas usage patterns, gas generation, and issues such as leakage and venting).

Between March and April 2022, Barauni Dairy coordinated a series of field interventions in light of insights generated by Smart Biogas. During this period 33 farmers whose digesters were connected to Smart Biogas received one or more visits by the dairy's staff. These visits were informed by data from Smart Biogas meters, with in-person visits used to verify incidences of leakage or venting, and more generally to check whether usage was in line with the values expected given the capacity of the installed digester. Evidence-based field interventions were then designed to minimise logistical costs, and involved fixing leakages, providing advice on feeding patterns most suited to usage requirements and manure availability, as well as regular operations and maintenance interventions such as burner cleaning and removal of blockages, water clearing from pipes, correcting faults in booster pumps, etc.

Results

The results were astounding. Thanks to evidence-based field interventions and an active monitoring approach to optimisation based on Smart Biogas data, **gas availability increased by 60%.** This means that, taking a fortnight period as a unit of time, the average farmer was able to expand their gas consumption from 6 to 10 m3 of volume, or from 19 to 29 hours of cooking time. In total after optimisation, an additional volume of **136 m3 of biogas became available** to the farmers in the pilot, corresponding to **312 additional hours of cooking time**.





Implications

User experience of biogas is often impaired by a limited sense of what is going on inside the digester "black box" – as a living system whose performance depends on several, human and nonhuman, factors.

While there are impressive examples of high-performing biogas companies, the sector is also characterised by several stories of stove stacking – that is, of users reverting to easier-to-use cooking methods – and, in some cases, of biodigester abandonment.

Even when plants are in use, limited availability of gas due to poor digester management results in suboptimal user experience, and may in the long run discourage users from turning to biogas as a clean cooking fuel. Assuming that users would be looking to replace unavailable biogas with more polluting alternatives, poor digester management also leads to both unmitigated methane emissions from biodigesters, and additional emissions from alternative fuels.

At Inclusive Energy, we believe remote monitoring can unlock huge opportunities – not only for yielding better value on the voluntary market for carbon credits, but also for improving biodigester performance. An evidence-based approach to optimising performance can yield incredible results, as demonstrated in the context of this pilot. In the first instance, such results reflect improved user experience and trust in biogas as a clean cooking fuel and technology. Improved user experience in turn enhances the environmental benefits of adopting and promoting biodigester usage and strengthens the credibility of the sector.

Conclusion

There are important, social and environmental reasons for taking an "active monitoring" approach to biodigester usage optimisation. At Inclusive Energy we believe in the promise of the digital pathway to impact. Over the last few years, we have been putting this approach to test through a series of pilots – the first of which took place in Bihar over a two-month period and was incredibly successful. Currently, we are piloting the same approach on a more systematic basis and over a longer period of time – in collaboration with our partners Africa Bioenergy Programs in Kenya and Biogas Solutions Uganda in Uganda. By 2025, we intend to offer a less labour intensive monitoring approach by making automated insights readily available to users through alerts and notifications, enabling farmer-led digester optimisation.