

# Researchers turn food waste into clean energy, fertiliser

The innovation, producing biogas, bio-pesticides and bio-fertilisers from bio-waste, seeks to address deforestation.

BY SAMILU BUSEIN

In Uganda, household dependence on wood-based fuels remains overwhelming.

According to the 2024 National Population and Housing Census, eight in every 10 rural households rely on firewood for cooking, double the 41 percent of urban households that primarily use charcoal.

Overall, 65 percent of Uganda's 10.6 million households use firewood as their main energy source.

With President Museveni's ban on charcoal burning, coupled with the rising cost of electricity and the well-documented health and environmental risks associated with wood fuel, the need for affordable and clean energy alternatives has become urgent.

It is within this context that six researchers from different universities have developed an affordable bio-digester capable of converting household food waste into biogas for cooking and lighting.

The resulting bioslurry is enriched with plant extracts to form an integrated bio-fertiliser and bio-pesticide that boosts crop yields while protecting crops from common pests.

## Three-in-one solution

Dr Patience Tugume, the project's lead researcher from Makerere University, explains that the innovation, producing biogas, bio-pesticides and bio-fertilisers from bio-waste, seeks to address deforestation caused by

firewood and charcoal use, as well as the environmental degradation associated with fossil fuels.

The originality of the project, she says, lies in its "three-fold benefits" of: conserving plant species targeted for firewood and charcoal, reducing carbon emissions through cleaner energy production, and producing ecofriendly bio-fertilisers and bio-pesticides that reduce the negative impacts of inorganic agricultural inputs on soil and human health.

The project's first demonstration site has been established at Frevasema Ltd in Biharwe, Mbarara City.

The technology is being used to advance three pillars of sustainability, and these include; economic sustainability through production of low-cost biogas and bio-fertiliser products, environmental sustainability through reduced deforestation and eco-friendly waste management, and social sustainability through skills development and livelihood enhancement, especially for women and youth.

"Most biogas projects rely on cow dung as feedstock," Dr Tugume notes. "Our uniqueness is in using diverse household bio-wastes such as banana and potato peelings, leftover food, and vegetable offcuts to produce not only biogas but an integrated bio-fertiliser and bio-pesticide."

Dr Tugume is working alongside Prof Byarugaba Bazirake from the Department of Food Science and Technology, Kyambogo University; Prof Maud Kamatenesi from MAMITA Technical and Business Management Institute, and Dr Savina Asiimwe from the Department of Plant Sciences, Microbiology and Biotechnology, Makerere University.

Others are Ms Catherine Kiconco, an associate researcher and assistant lecturer, Bishop Stuart University, and Mr Robert Muhumuza, a postgraduate student, department of Plant Sciences, Microbiology and Biotechnology, Makerere University.

## TIP

Six researchers from different universities have developed an affordable bio-digester capable of converting household food waste into biogas for cooking and lighting. The resulting bioslurry is enriched with plant extracts to form an integrated bio-fertiliser and bio-pesticide that boosts crop yields.

These researchers are transforming household waste into clean energy, improved soil fertility, and livelihood opportunities contributing not only to Uganda's bio-economy but also to a more sustainable future.

The project aims to equip households with skills to convert organic waste into value-added products.

Dr Tugume says 40 women and youth have already been trained at the Mbarara site.

The initiative, she says, reduces the time women and young people spend searching for firewood, allowing them to engage in income-generating activities and pursue education, ultimately helping reduce gender disparities.

## Benefactors

She attributes the project's progress to an Early Career Research Grant she received from the Organisation for Women in Science for the Developing World (OWSD), a Unesco programme funded by Canada's International Development Research Centre (IDRC).

The benefits, she explains, are far-reaching and they include improved health due to reduced indoor smoke pollution, enhanced agricultural

productivity through use of the integrated bio-fertiliser-bio-pesticide, and household savings, since families will spend less on fuel and agricultural inputs.

## How the technology works

The innovation produces three outputs: biogas, bio-fertiliser, and bio-pesticide from one bioprocess. The process uses spontaneous fermentation driven by naturally occurring microorganisms in food and animal waste.

Prof Bazirake explains that the method demonstrates the power of "biotransformation," turning raw food waste into products that solve household-level problems, from energy shortages to soil infertility.

In urban centres where organic waste often becomes a sanitation hazard, the technology offers a sustainable disposal method.

Unutilised domestic waste can instead become a source of income through fertiliser and biogas production, while also improving environmental hygiene.

Ms Kiconco highlights that the project will also create jobs for youth involved in garbage collection and sorting.

"Biogas production will reduce reliance on fuel wood and charcoal," she says, "slowing deforestation and preserving soil cover."

One Ugandan scholar described this approach as "throwing one stone to kill two birds without injuring any", solving waste management and energy challenges simultaneously.

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Unique

## Materials

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The innovation project team with some of the trainees in biogas production at Frevasema Ltd, Biharwe, Mbarara.

PHOTO: SAMILU BUSEIN