Affordable, highly efficient cold boxes poised to help tackle food waste for small farmers in East Africa

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RADiCool. Credit: RADiCool

A collaboration between Aston University and RAD Global will help small farmers in East Africa keep food fresher for longer, preventing food waste and improving livelihoods.

Working with other partners, they have developed pioneering cold storage boxes which can keep food fresh without access to grid electricity.

While working in Uganda, Tim Messeder, founder of UK agricultural development company RAD Global, noticed that small scale fishers in Uganda had a major problem keeping fish fresh. The African country is large, and this causes an issue with keeping fish fresh in the blistering heat after they are caught from Lake Victoria and from various fishponds spread around the country in remote locations.

The fishers, many of whom are women, have to transport their catch for up to nine hours, during which time their harvest goes off. Surveys across the region reveal that 42% of traders experience fish spoilage due to inadequate cooling, resulting in lost income and increased food insecurity.

To help prevent waste, Tim drew up a plan for a cool box that could keep fish fresh for up to 48 hours, could be transported on the back of a motorcycle and was affordable to people on very low incomes. He contacted Aston University and between the two they developed his idea into the prototype now known as RADiCool, which aims to extend the safe selling window for fish from 12 to 24 hours. The prototype development was supported by the Efficiency for Access Research and Development Fund.

The RADiCool system features a lightweight, insulated cold box powered by advanced phase change material (PCM) and integrated internet of things (IoT) technology for real-time temperature and GPS monitoring. The innovative system cools fish from 25°C to refrigeration temperatures within four hours and maintains cold storage conditions for over 24 hours, without additional pre-cooling capacity. Purpose-built to fit on motorbikes—the primary transport mode for rural

vendors—RADiCool is practical, scalable, and tailored to first and last mile delivery needs in resource-constrained settings.

PCM technology is an environmentally friendly solution for maintaining cooling temperatures. The materials absorb and release energy as they transition from solid to liquid and back again, similar to the process of ice melting and refreezing.

These specially designed PCMs can maintain a consistent cold temperature for extended periods without the need for continuous electricity. This makes them particularly suitable for transporting food, medicine, and other temperature-sensitive items in an energy-efficient way. The PCM panels for RADiCool are frozen in solar-powered hubs for later use in precooling and storing the fish at the desired temperature.

Tim Messeder said, "RADiCool brings together cutting-edge technology while taking into account the challenging realities of the African context.

"We are committed to empowering small-scale traders with sustainable solutions that reduce waste and improve livelihoods."

The project's success marks a major step forward in addressing the cold chain gap in Africa's informal food markets. Through field testing and technical iteration, the team has developed a system that can function effectively off-grid, supporting food security and economic resilience in the face of climate and infrastructure challenges.

RAD Global and Aston University are now focusing on scaling and commercialization. Planned next steps include finalizing the new special design PCM panels, partnering with manufacturers, expanding field trials, and deploying a pay-per-use business model to increase accessibility. Ongoing collaboration with other partners (ThinkAqua UK, Therma-Inova UK and Dulotrop Uganda) will ensure further staff

training, impact evaluation, and long-term sustainability.

"RADiCool demonstrates the power of cross-sector innovation in addressing global development challenges," said Dr. Ahmed Rezk, senior lecturer in mechanical, biomedical & design engineering at Aston University. "We're proud to contribute scientific expertise that translates directly into practical, community-driven solutions."

Provided by Aston University

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