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Building AI platform to help food security

18 June 2026 | News

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Each day, tonnes of nutrient-rich agri-food waste are generated worldwide, including damaged crops that have either rotted in the field or gone unharvested. This waste can be fermented using microorganisms such as yeast to produce upcycled, high-quality sustainable protein, which can be incorporated into conventional food products or used to create meat and dairy alternatives. The process represents a significant opportunity to advance the circular bioeconomy.

However, converting agri-food waste into protein through fermentation remains a complex challenge due to the highly variable nature of agricultural waste streams. Designing optimal fermentation and downstream processing systems requires numerous technical decisions, making the process both time-consuming and expensive. As a result, upcycled protein often struggles to compete on cost with conventional protein sources.

A global team of researchers, led by the University of Leeds, is now seeking to overcome this challenge through artificial intelligence. The team is developing an AI-powered platform capable of identifying the optimal fermentation conditions required to produce microbial protein at the lowest possible cost.

The new tool is expected to provide actionable insights on the selection of yeast strains, fermenter configurations and ideal process parameters, enabling industry players to develop customised proteins more efficiently. By streamlining process design, the platform aims to make microbial protein production cost-competitive with non-upcycled alternatives.

Professor Nicholas Watson, Professor of Artificial Intelligence in Food at the School of Food Science and Nutrition, University of Leeds, said: â??To make a meaningful impact on global food security, upcycled protein must move beyond being a niche

option and be priced competitively with products already available on supermarket shelves.â?•

He added: â??To truly impact global food security, upcycled protein can't just be a niche alternative, it has to compete on price with what is already on the supermarket shelf. We are excited to work with CSIRO and partners across the globe to bridge that gap, launching an AI platform to turn agri-food waste into sustainable protein.â?•

The initiative brings together expertise in artificial intelligence, fermentation science and food systems innovation.

Dr. Kai Knoerzer, Principal Research Scientist at CSIRO, said: â??Billions of tonnes of nutrient-rich material are currently being lost every year. If we want a more resilient food system, we need tools that make valorisation simple and scalable. Partnering with the University of Leeds, we are combining AI, fermentation science and real case studies to deliver a practical solution that helps industry turn waste into sustainable protein at scale, and we are genuinely looking forward to getting started.â?•

The project is supported by the Bezos Earth Fund, which is backing 15 global initiatives focused on scaling AI-powered solutions to address biodiversity loss, climate change and food insecurity.

Dr. Amen Ra Mashariki, Director of AI and Data Strategies at the Bezos Earth Fund, said: â??These projects show how AI, when developed responsibly and guided by science and local knowledge, can strengthen environmental action and ensure its overall impact on the planet is positive.â?•