Lingnan University 2024/2025 SDG Report
SDG 2 – ZERO HUNGER

18
Undergraduate Courses

19
Research Projects and Grants

2.3
Field Weighted Citation Impact

83%
Internationally Collaborated Papers

Lingnan University is dedicated to advancing Sustainable Development Goal 2 (SDG 2) – Zero Hunger through innovative, evidence-based research that fosters sustainable food systems and strengthens community resilience. By integrating science, technology, and social impact, Lingnan promotes solutions that address food security, resource efficiency, and agricultural sustainability. The University's researchers actively develop transformative approaches that reduce waste, enhance productivity, and support circular economies—empowering local communities while contributing to global efforts to eradicate hunger. The following impact cases exemplify Lingnan's commitment to building a more sustainable and food-secure future.

Initiatives to measure and reduce food waste

Food waste constitutes approximately 30 percent of Hong Kong's municipal solid waste in landfills, creating significant ecological strain and squandering valuable organic resources. In response, Lingnan University has implemented a comprehensive suite of initiatives to combat waste on campus. These include a smart recycling system, rigorous tracking and management of food waste, and alignment with the Waste Blueprint for Hong Kong 2035. A key program is the "Bug Wars Against Food Waste" project, which aims to reduce waste while inspiring students, faculty, and the wider community to embrace a low-carbon lifestyle. Furthermore, the university co-launched the Bi-Loop pilot programme, which innovatively converts pre-meal food waste into organic feed, completing a circular waste management solution.

Upcycling Fruit Waste into Nutritious and Sustainable Aquaculture Feeds to Enhance Fish Health

Global aquaculture plays a pivotal role in achieving SDG 2 – Zero Hunger, as it supports sustainable food production and resource efficiency amid rising demand for protein-rich seafood. In Hong Kong, the industry faces challenges related to feed sustainability, with the SAR Government targeting an expansion of Fish Culture Zones to 800 hectares and a tenfold increase in fresh fish production to 6,000 tonnes over the next 15 years. Funded by the LNG–Fisheries Enhancement Fund (FEF23101), Professor Ip addresses these challenges by upcycling fruit waste into fermented fruit waste (FFW) additives for aquafeeds, in collaboration with local farmer Mr. Wong Chin Ming to promote circular economy practices.

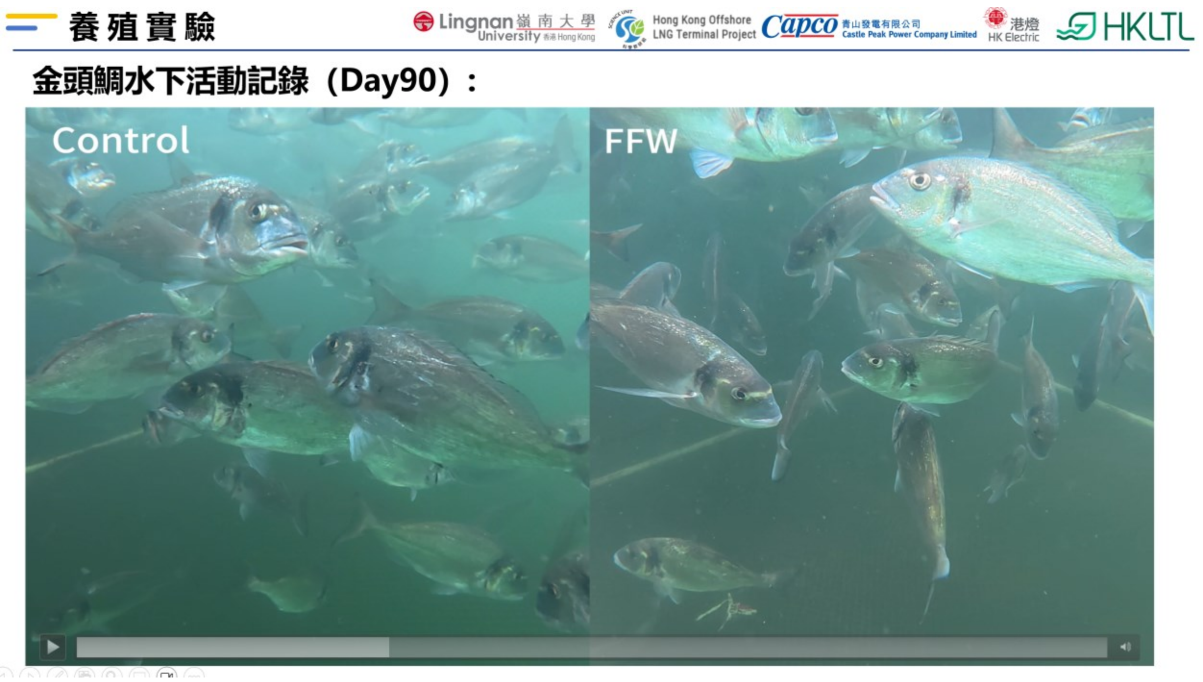
The initiative focuses on developing FFW as a cost-effective, ecofriendly supplement to enhance growth, health, and resilience in farmed fish such as gilthead seabream. The team streamlined FFW production protocols using locally sourced fruit waste, which is fermented to produce bioactive compounds that improve nutrient absorption and stress resistance. In controlled feeding trials conducted over six months, FFW- supplemented groups exhibited superior performance. From the sixth week, relative growth rates were higher, culminating in a 20.3% increase in weight gain by week 10 and a 13.2% increase by the end of the experiment compared with controls. Feed utilization- efficiency also improved, along with enhanced antioxidant enzyme activities—glutathione reductase (GR) increased by 96.4% and superoxide dismutase (SOD) by 10.2%—while the oxidative damage marker malondialdehyde (MDA) decreased by 83.4%, strengthening the fish's resilience to disease and environmental stressors.

These results underscore the potential of FFW to reduce reliance on traditional feeds, minimize waste, and bolster disease resistance—aligning with the goals of

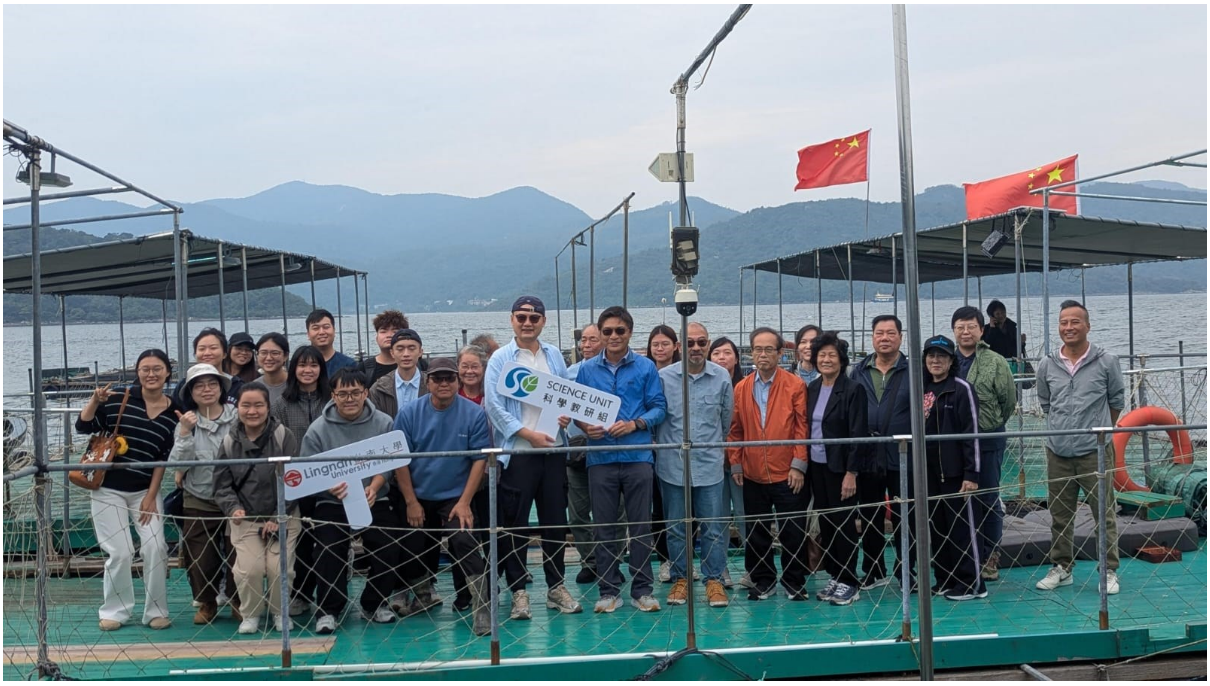
SDG 2: Zero Hunger by advancing sustainable agriculture and food security. To disseminate these findings, on 27 October 2025, the team organized workshops for local fishermen, funding bodies, AFCD officials, and academics, sharing protocols and outcomes to facilitate wider adoption.

Overall, this project exemplifies the Science Unit at Lingnan University's commitment to impactful research that fosters sustainable aquaculture, contributing to Hong Kong's agricultural vision and global zero hunger efforts. By transforming waste into valuable resources, it enhances productivity, environmental health, and community resilience—paving the way for scalable innovations in mariculture.

Fish culture, fish measurement, and sampling during the project.



Video shoot of gilthead seabream



FEF workshop at Wong Shek fish raft on October 27, 2025.

Tackling Food Waste through Innovation and Collaboration

Beyond recycling, Lingnan University is also taking proactive steps to combat food waste through innovative and data-driven approaches. The University systematically tracks food waste on campus to identify reduction opportunities and raise awareness of sustainable consumption. Through the “Bug Wars Against Food Waste” initiative, Lingnan explores creative biological solutions that transform organic waste into valuable resources. In collaboration with industry partners, the University continues to develop effective strategies and technologies to minimize food waste generation, promote circularity, and contribute to a more sustainable campus community. [Link]

Bug Wars Against Food Waste

As part of Lingnan University's ongoing commitment to sustainability and circular innovation, the University has launched the "Bug Wars Against Food Waste" initiative, which harnesses the natural power of black soldier flies (BSF) to transform organic waste into valuable resources. This innovative approach not only reduces landfill burden but also showcases how nature-based solutions can drive environmental and social impact. Using IoT-enabled monitoring systems, the BSF larvae convert food waste into protein-rich feed and nutrient by-products, supporting sustainable agriculture and aquaponics. Through this hands-on, science-driven initiative, Lingnan promotes public awareness, student engagement, and cross-sector collaboration—turning food waste from a problem into a powerful model for circular economy and sustainable living. [Link]

The black soldier fly food waste processing facility utilises Internet of Things (IoT) technology to enhance operational efficiency.

Green Innovations for Controlling Tomato Leaf Spot Disease

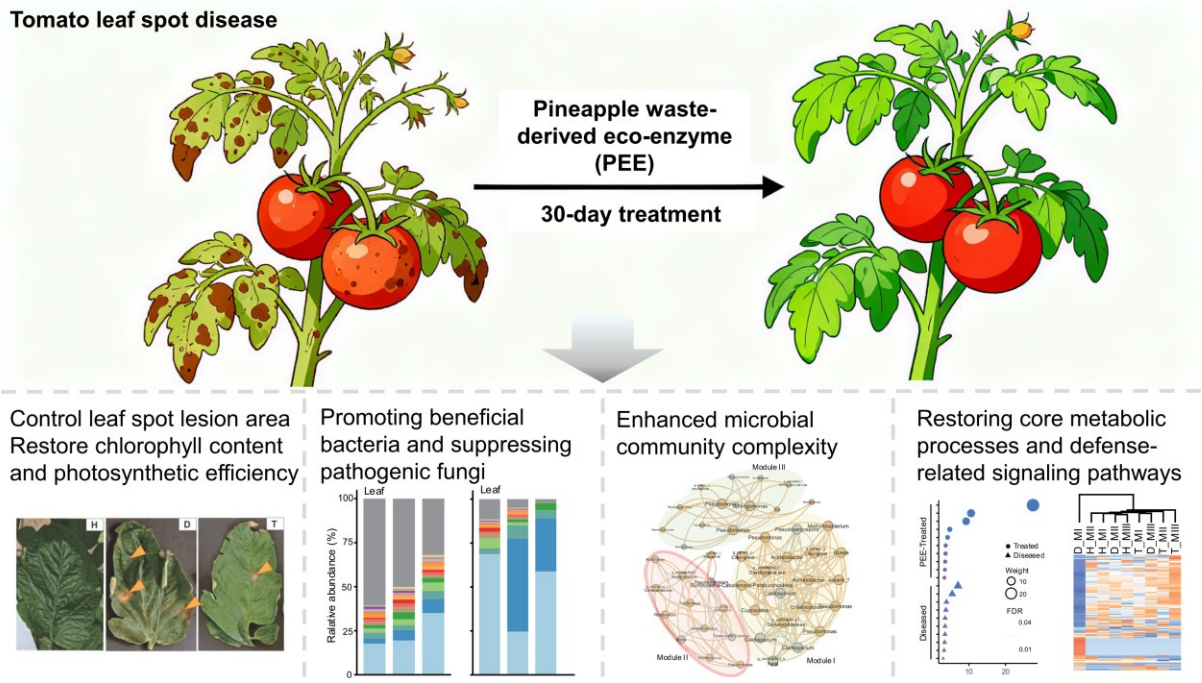
Fungal diseases, such as leaf spots, pose a significant threat to crop yields globally, contributing to food insecurity and economic losses that directly hinder Sustainable Development Goal 2 (SDG2) – Zero Hunger. Traditional chemical controls often harm ecosystems, highlighting the urgent need for green alternatives. Funded by Lingnan University's faculty research grant, Prof. Ip explores the potential of a pineapple waste-derived eco-enzyme (PEE) as a sustainable bioagent for managing tomato leaf spot disease, thereby promoting eco-friendly agriculture through waste upcycling.

In a comprehensive 30-day field trial, PEE was applied to infected tomato plants, resulting in significant improvements. Notably, lesion areas were reduced by 74.6%, while chlorophyll content and photosynthetic efficiency (Fv/Fm) were restored to healthy levels. High-throughput sequencing revealed that PEE effectively modulates the microbiome: it enriched beneficial bacteria such as *Pseudomonas*, *Bacillus*, and *Paenibacillus* in both the phyllosphere and soil, while simultaneously suppressing harmful pathogens from the Mycosphaerellaceae family and *Cladosporium*. Co-occurrence networks indicated increased complexity in treated samples, characterized by a higher number of nodes and edges, suggesting enhanced community stability.

Functional metagenomics analysis underscored PEE's role in normalizing disrupted biological pathways. It downregulated stress responses, such as cyanoamino acid metabolism, and restored critical defense mechanisms, including C-type lectin and Toll-like receptor signaling. We attribute these beneficial effects to PEE's dual action: antimicrobial metabolites derived from *Lactobacillus* fermentation directly inhibit fungal pathogens while simultaneously activating induced systemic resistance (ISR) within the plant holobiont. Collectively, PEE enhances the plant's natural defense system and promotes microbiome health, serving as a core mechanism for eco-friendly disease control.

This innovation positions PEE as a scalable, low-cost solution for disease control, significantly reducing dependence on pesticides and enhancing crop resilience. By repurposing fruit waste, PEE supports circular economies, minimizes environmental impacts, and promotes sustainability in food production. The project's outcomes provide practical tools for farmers, aligning with SDG2's focus on resilient agricultural practices and eradicating hunger.

The Science Unit at Lingnan University underscores its commitment to impactful research that bridges academia and agriculture. Future scaling of PEE’s application could extend its benefits to other crops, amplifying global efforts toward achieving Zero Hunger through microbiome based- interventions.


Tomato leaf spot disease
Pineapple waste-derived eco-enzyme (PEE)
30-day treatment
Control leaf spot lesion area
Restore chlorophyll content
and photosynthetic efficiency
Promoting beneficial bacteria and suppressing pathogenic fungi
Enhanced microbial community complexity
Restoring core metabolic processes and defense-related signaling pathways
H
D
T
Leaf
Leaf
Ralative abundance (%)
Module III
Module II
Module I
PEE-Treated
Diseased
Treated
Diseased
Weight
FDR