Lingnan University 2025/2026 SDG Report
SDG 2 – ZERO HUNGER



No. 1 in Hong Kong (THE Sustainability Impact Ratings 2026)

117 Research Outputs

18 Undergraduate Courses

84% Internationally Collaborated Papers

Lingnan University is committed to advancing Sustainable Development Goal 2 (SDG 2): Zero Hunger through innovative, evidence-based research that supports sustainable food systems and community resilience. As it transforms into a comprehensive, research-oriented university in the digital era, Lingnan brings together science, technology and social inquiry to address challenges in food security, resource efficiency and agricultural sustainability. Its researchers explore approaches to reducing waste, improving productivity and supporting circular economies, with a focus on contributing to the wellbeing of communities in Hong Kong and beyond. The following research and impact cases illustrate Lingnan's contributions to a more sustainable and food-secure future.

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

Research led by Professor Ip Chi Ho, Associate Professor (Presidential Early Career Scholar) in Lingnan University's Division of Science, supports SDG 2: Zero Hunger by developing sustainable aquaculture feed additives that enhance fish health and contribute to local food security and sustainable food production.

Hong Kong's aquaculture sector is central to local food security. The government aims to expand Fish Culture Zones to 800 hectares and raise marine fish production tenfold to 6,000 tonnes within 15 years. However, feed costs already account for 50–70% of operating expenses, while rising fishmeal and soybean meal prices constrain expansion. Fruit-processing

waste, especially orange peels rich in polyphenols, flavonoids, vitamins and minerals, offers an underused feedstock for sustainable feed additives.

Supported by the LNG-Fisheries Enhancement Fund (FEF23101), the research team developed a simple, replicable process for producing fermented fruit waste (FFW). Fresh orange peels from local juice factories underwent 30-day submerged fermentation in 50-litre containers. Temperature, pH and dissolved oxygen monitoring, combined with 16S rRNA sequencing and metabolomics, confirmed a stable process. By day 30, *Acetobacter* and yeasts dominated, 3,633 metabolites were identified, anti-nutritional factors were reduced, and growth-promoting, antioxidant and immune-related compounds were enriched.

A 180-day field trial with gilthead seabream at Sai Kung fish rafts—three cages per treatment, with approximately 350 fish per cage—showed that FFW supplementation increased weight gain to 71.91%, compared with 59.65% for commercial feed controls, and lowered the feed conversion ratio to 7.82 from 9.09. Antioxidant capacity improved markedly, with glutathione reductase activity increasing by 96.4% and malondialdehyde decreasing by 83.4%. Lysozyme and immunoglobulin M levels also rose significantly. Multi-omics analyses revealed adaptive gut-microbiome remodelling, fewer opportunistic pathogens on gills, higher flavour nucleotide levels in muscle, and enhanced energy-production and detoxification pathways in the liver.

Four outreach seminars reached over 100 participants, including fishermen, government officials and academics, with trial fish and FFW samples distributed free of charge. The project establishes a “waste valorisation–performance validation–industry adoption” pathway, demonstrating the potential of FFW as a low-cost, easy-to-produce functional feed additive. By supporting resource-efficient aquaculture, reducing feed costs and improving fish health and product quality, the research contributes to resilient food production systems and provides evidence to inform sustainable aquaculture policy in Hong Kong and beyond.

Fish raft photographic record















Figure X. Photos of the FFW results-sharing seminar held at the Sai Kung fish raft; (A) Guests traveling to the fish raft by shuttle boat from Wong Shek Pier; (B) Professor Yip Chi-ho of Lingnan University presenting the research findings of the FFW project; (C) Mr. Wong Chin-ming, agricultural expert from Hong Yat Farm, demonstrating FFW usage techniques; (D) Professor Yip Chi-ho and Mr. Wong Chin-ming discussing FFW details with participating fishermen; (E) Guests taking their seats at the seminar; (F) Group photo of FFW project staff, fish raft staff, and seminar guests.

Leveraging Pineapple-Derived Eco-Enzyme for Sustainable Microbiome Modulation to Manage Tomato Leaf Spot Disease

Research led by Professor Ip Chi Ho, Associate Professor (Presidential Early Career Scholar) in Lingnan University's Division of Science, advances SDG 2: Zero Hunger through sustainable agriculture, crop resilience and protection of food production. Accepted for publication in the *Journal of Agriculture and Food Research*, the study explores a pineapple waste-derived eco-enzyme (PEE, also known as "Jiaosu") for managing tomato leaf spot disease.

Fungal leaf spot diseases threaten global tomato production, causing severe defoliation, reduced photosynthetic capacity and yield losses of up to 50% under humid conditions.

Conventional synthetic fungicides can lead to pathogen resistance, environmental harm and disruption of beneficial microbial communities. In collaboration with a local farm, the researchers developed PEE as a sustainable, circular bioagent.

PEE is produced through controlled fermentation of pineapple peel and core residues, representing 50–60% of the fruit mass, with water and a starter culture. This process enriches beneficial microbes, particularly *Lactobacillus* and *Acetobacter*, and generates antimicrobial metabolites such as isorhamnetin and succinic acid.

In a 30-day field trial on naturally infected tomato plants, daily foliar and soil applications of 2% PEE reduced leaf spot lesion area by 74.6% compared with untreated diseased controls. Photosynthetic efficiency and chlorophyll content recovered to levels comparable with healthy plants. Metagenomic analyses showed that PEE restructured leaf- and root-associated microbiomes, enriching beneficial bacteria while suppressing pathogenic fungi. More complex microbial co-occurrence networks indicated improved community stability.

PEE acts through direct pathogen suppression by bioactive metabolites and indirect protection through microbiome reconfiguration, enhancing plant defence functions and induced systemic resistance. Functional profiling also revealed restored defence-related metabolic pathways.

By converting fruit-processing waste into a low-cost biocontrol agent, this research offers a pathway to reduce reliance on synthetic fungicides and strengthen resilient food production systems. It supports resource-efficient farming and circular bioeconomy principles, with potential applications for smallholder and larger farms, while also contributing to SDG 12 and SDG 15.

Bridging the Gap: An eDNA Approach to Ecological Assessment and Conservation of Scleractinian Corals

Led by Professor Ip Chi Ho, Associate Professor (Presidential Early Career Scholar) in Lingnan University's Division of Science, this project investigates how to develop and apply a streamlined environmental DNA (eDNA) method to assess and conserve scleractinian (reef-building) coral communities in Hong Kong waters.

Shallow-water coral reefs are marine biodiversity hotspots with high socio-economic value. Healthy reef ecosystems also support fisheries and contribute indirectly to food security and sustainable livelihoods. However, climate change and anthropogenic activities have caused a global decline of over 50% in coral cover and associated marine life. Conventional monitoring relies heavily on time-consuming visual surveys that are impractical for rapid assessment

across many sites. Few eDNA studies have targeted reef-building corals, primarily because of the lack of robust primers and standardised methods.

To address this gap, the project develops novel scleractinian-specific primers against an enhanced DNA reference database encompassing over 100 coral colonies. These are validated through water sampling and visual surveys at Hoi Ha Wan Marine Park, known for hosting one of the best coral communities in Hong Kong waters. The streamlined eDNA approach is then applied at 33 Reef Check sites across Hong Kong over two seasons.

The findings contribute to SDG 14: Life Below Water by demonstrating the application of eDNA for coral reef monitoring and marine ecosystem conservation, revealing spatial and temporal variation in coral community composition, and informing evidence-based conservation measures and predictions of reef responses to climate change and anthropogenic disturbance. By supporting the protection of habitats that underpin marine resources, the project also has indirect relevance to SDG 2: Zero Hunger, particularly the ecological foundations of fisheries and food security.

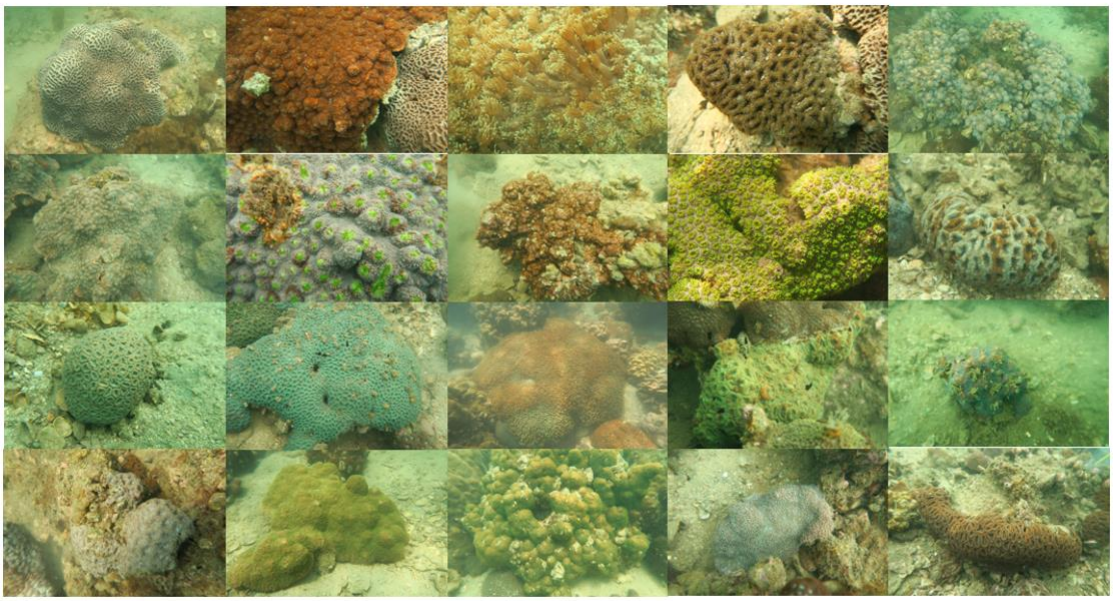
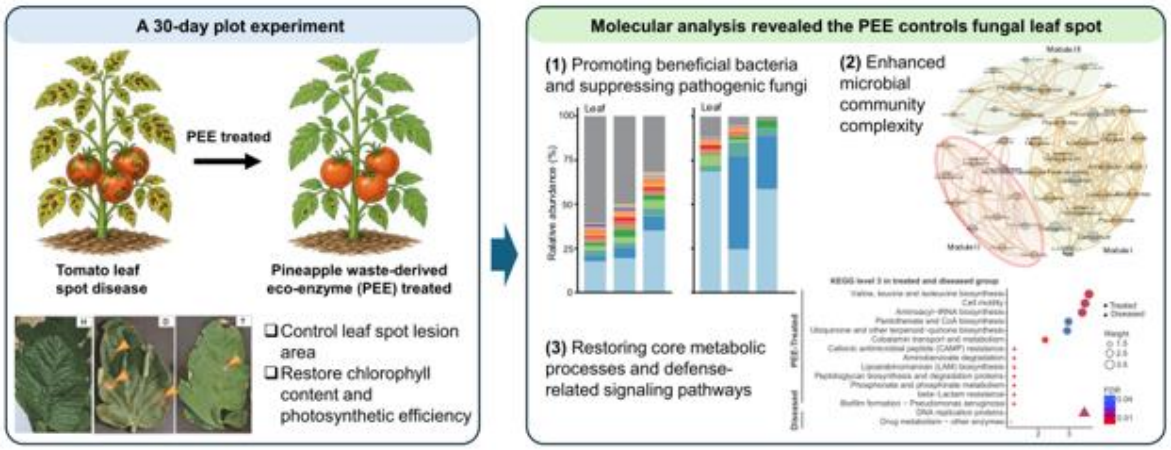


Figure 1. *In-situ* close-up photographs of scleractinian corals taken during field sampling.



Figure 2. Water sampling and filtering after survey. **(A and B)** Research assistant using water sampler to collect seawater at field site. **(C and D)** The setup of water filtering system, which are soaked with 10% bleach solution and rinsed with Milli-Q water before using. All collected seawater were stored in ice box temporarily and transfer to lab to filtering seawater. **(E)** The filtered membrane was storage at – 80 °C freezer.

Graphical abstract



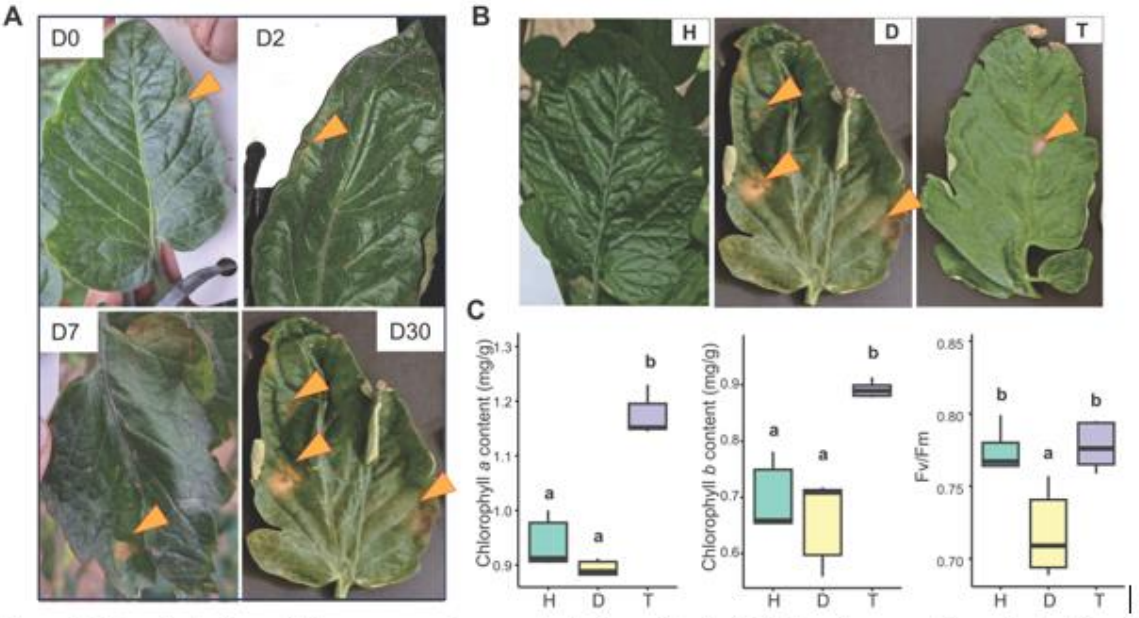


Figure X. Tomato leaf spot disease symptoms and photosynthesis. **(A)** The changes of tomato leaf spot disease symptoms on day 0 (D0), D2, D7 and D30, which showed the peak lesion expansion on day 30. **(B)** The healthy (H), diseased (D) and the PEE-treated (T) leaves on day 30. **(C)** The chlorophyll *a* and *b* content and photosystem II efficiency (Fv/Fm ratio) of H, D and T leaves on day 30.



Figure X. Photos showing the raw pineapple waste, grinded materials, and the finished eco-enzyme product, as well as the monitoring and sampling for downstream analysis.



Tomato photography

Enhancing food assistance services in Hong Kong: Addressing food poverty and promoting food security

This qualitative study, led by Professor AU YEUNG Tat Chor, Associate Professor in the Department of Sociology and Social Policy, aimed to examine the delivery of food assistance services in Hong Kong. The research aligns with SDG 2: Zero Hunger, particularly Target 2.1,

which calls for ending hunger and ensuring access to safe, nutritious and sufficient food for all, especially people experiencing poverty and vulnerability.

Despite the recent expansion of state-funded foodbank services outsourced to non-governmental organisations (NGOs), the provision of in-kind services to the poor has always been linked to means-testing and the stigmatisation of service users. This may reduce service uptake and adversely affect their social impact in preventing food poverty and insecurity. Therefore, it was important to investigate how NGOs and social workers deliver food assistance services, with a focus on equitable access.

This project was completed in 2023. Overall, the study conducted in-depth interviews with 24 social workers from 7 foodbank operating agencies and 7 non-funded food service projects. The findings reveal that food assistance policy and services were shaped by micro, meso and macro factors. First, everyday frontline interactions between workers and clients influenced how users perceived foodbanks and shaped their actual experiences of receiving food. Second, organisational settings, such as funding models and agencies' linkages with other social services, determined the delivery of food assistance, whether it was carried out on an individual basis or involved a range of community activities. Multiple-service approaches could reduce the stigma of using foodbanks. Finally, policy contexts and government-directed NGOs shaped service models and workers' caseloads in food services, defining the meanings, spaces and resources of service providers.

The service implications of this research lie in implementing a dignity-driven and needs-based approach to food assistance. As some service providers incorporated social innovation and empowerment that went beyond the policy objective of reducing food poverty, diversifying food service programmes would be necessary to de-stigmatise food assistance. Policy suggestions are also made to promote stronger participatory components in service design, including users' voices, food choices and mutual-help programmes, supporting inclusive and participatory food assistance services. Reforming the food assistance system at different levels; could effectively alleviate food poverty and insecurity, contributing to SDG 2's goal of ending hunger and improving food security.