

Abstracts of the 11th IUFoST-Japan International Webinar on
Food Science and Technology
Commercialization Based on Food Engineering

Mar. 17th, 2026



IUFoST-Japan

11th IUFoST-Japan International Webinar on Food Science and Technology Commercialization Based on Food Engineering

Date: March 17th, 2026 (Tue) 15:00~17:55 (JST) (Online, Zoom webinar)

Hosted by IUFoST-Japan and The Japan Society for Food Engineering (JSFE)

Organizer: Atsushi Hashimoto and Kazutaka Yamamoto

Co-organizer: Yasuki Matsumura, Kentaro Matsumiya

Program

15:00-15:05

Opening Remarks

Yasuki Matsumura (President of IUFoST-Japan, Kyoto University)

15:05-15:45

Advancements in Food Processing from Conceptualization to Commercialization

Soojin Jun (University of Hawai'i)

15:45-16:25

From Innovation to Scale: Food Engineering Approaches for Alternative Protein Foods

Roman Buckow (La Trobe University)

16:25-16:30

break

16:30-17:10

Commercialization of Foods Processed by High Hydrostatic Pressure; Difficulties and Trends in Japan

Kazutaka Yamamoto (IFR, NARO)

17:10-17:50

Emerging Process Technologies for More Sustainable Protein-rich Food and Feed: Insights from International Public-private Partnerships

Alexander Mathys (ETH Zurich)

17:50-17:55

Closing Remarks

Kazutaka Yamamoto (IFR, NARO)

Advancements in food processing from conceptualization to commercialization

Soojin Jun

*Department of Human Nutrition, Food and Animal Sciences
University of Hawai`i at Manoa, USA*

The food industry is on the verge of a revolution in food processing. With growing consumer demand for superior-quality products, researchers have been exploring alternative processing techniques to enhance the quality of processed foods. Among these techniques are ohmic and infrared heating, as well as microwave & radio frequency waves for heating purposes. Since thermal treatment can compromise the nutritive value of food, researchers have paid attention to novel non-thermal techniques to combat microorganisms. These approaches include pulsed light, pulsed electric field, ultraviolet radiation, membranes, high pressure, ultrasonic waves, irradiation, and ozone treatment. The advantages offered by these technologies include better product quality, a new line of products, convenience, automation, higher throughput, selectivity of heating, reduced overall costs, and the ability to process heat-sensitive products. If successfully implemented, these advancements promise tomorrow's consumers access to safe, nutritious, high-quality food products through novel food processing technologies. The journey from laboratory-scale experimentation involving ideation, conceptualization, experimental design, brainstorming, teamwork, and supervision to the development of significant intellectual properties (IP) is evident. However, the challenge and perseverance lie in effectively translating these IPs into the commercialization of food processing technologies. This presentation will address some case studies illustrating the commercialization of food processing technologies, spanning from small-scale lab setups to commercially viable large-scale production, thereby impacting existing food supply chains across various food products.

Soojin Jun is a Professor of food engineering and serves as a Graduate Chair in the Department of Human Nutrition, Food and Animal Sciences at the University of Hawaii at Manoa. He has authored more than 100 refereed journal publications in the areas of emerging food processing technologies, including thermal and non-thermal food processing, system modeling and simulation, biosensing, food nanotechnology, and food preservation. He has served as editor and peer-reviewer for various international journals and is a leading editor of a popular Food Engineering book entitled "Food Processing Operations Modeling: Design and Analysis" published by Taylor & Francis. He is currently a member of Institute of Food Technologists (IFT) and a founder of Jun Innovations Inc., which has developed a proprietary supercooling technology that preserves perishable materials at below-freezing temperatures without the formation of ice crystals.

From Innovation to Scale: Food Engineering Approaches for Alternative Protein Foods

Roman Buckow

La Trobe University, Australia

Global food systems are facing increasing pressure to deliver nutritious foods while reducing environmental impacts. Livestock production occupies a large share of agricultural land and contributes significantly to greenhouse gas emissions, yet demand for animal-derived foods is projected to continue rising. As a result, alternative proteins have emerged as a promising pathway to support more sustainable and resilient food systems.

Legumes and other plant protein sources are central to this transition due to their favourable nutritional profile and versatility in food processing. They are rich in protein, dietary fibre, and bioactive compounds associated with cardiometabolic health benefits. However, the broader adoption of plant-based foods remains constrained by sensory challenges, including “beany” flavours, limited functionality of plant proteins, and the presence of anti-nutritional factors. Addressing these barriers requires the application of food engineering approaches that transform plant proteins into ingredients and food matrices capable of mimicking the structure, texture, and eating experience of meat.

Advances in food processing technologies have significantly expanded the capabilities for designing plant-based meat analogues. Techniques such as protein fractionation, fermentation, and extrusion processing improve protein functionality, digestibility, and flavour profiles. In particular, high-moisture extrusion has become a key technology for generating fibrous, meat-like structures from plant proteins through controlled thermomechanical treatment. Emerging technologies, including shear-cell processing, precision fermentation, and 3D food printing, are further expanding opportunities to tailor structure, flavour, and nutritional performance in alternative protein foods.

Despite rapid innovation, several scientific and engineering challenges remain. Replicating the hierarchical structure of muscle tissue, achieving desirable juiciness and flavour release, and maintaining nutritional quality during processing require a deeper understanding of protein interactions, phase behaviour, and water binding during dynamic processing conditions. Furthermore, the transition from laboratory prototypes to industrial production presents additional hurdles related to ingredient supply, process scalability, cost efficiency, and product consistency.

This presentation will highlight how food engineering principles can bridge the gap between innovation and commercialisation of alternative protein foods. Case studies from industry, including the development of plant-based meat products such as All G Foods' Love-BUDS range, will illustrate practical challenges in scale-up, supply chain management, and regulatory pathways. Collectively, these insights demonstrate how advances in ingredient science, processing technologies, and manufacturing systems can enable the successful development and large-scale adoption of next-generation alternative protein foods.

Prof Roman Buckow is the Director of the Centre for Food Science at La Trobe University. His work focuses on sustainable food manufacturing, alternative proteins, and advanced processing technologies. He previously held roles at the University of Sydney, CSIRO, and biotech startup All G Foods.

Commercialization of Foods Processed by High Hydrostatic Pressure ; Difficulties and Trends in Japan

Kazutaka YAMAMOTO

*Institute of Food Research
National Agriculture and Food Research Organization (NARO), Japan*

Food processing using high hydrostatic pressure (HHP) at 400 – 600 MPa has been commercially available in the world since its first industrial implementation in Japan as jams and dessert products in 1990. It is principally used for cold pasteurization of beverages, meat products, pastes, ready-to-eat meals, and pet foods as well as for shucking of shellfish and crustaceans.

Meanwhile, medium HHP (MHHP) at 100 MPa, which is relatively lower than the HHP for pasteurization objectives, has been used to process foods in Japan. Although MHHP can not pasteurize bacteria, it can suppress their growth, while promoting reactions of certain enzymes, which are often inhibited by the presence of NaCl which is indispensable to suppress growth of unfavorable bacteria during fermentation process of traditional Japanese foods such as soy sauce and miso (soybean paste). In addition, MHHP has been used to impregnate liquid into plant tissues to process fruit compotes.

Among HHP-processed foods in the world, HHP-processed juice and other beverages are the most popular. However, its market in Japan is quite limited, probably due to the Food Sanitation Act, which requires to prove equivalence in pasteurization efficacy of HHP-processed beverages to that of conventional heat-processed ones before their commercialization in Japan. Recently, we have proven the equivalence and successfully commercialized 6 items of HHP-pasteurized juice products manufactured in Japan.

As compared with that of heat processing, HHP food processing has only a short history of ca. 35 years, and thus we may expect further possibilities of HHP food processing to enrich our dining tables. Some phenomena specific to HHP treatment have not yet been commercially utilized. For instance, egg (protein) solidification was first reported in 1914, but food products utilizing the phenomena are not found in the market. We are currently working on HHP-solidified egg white toward its commercialization. In this talk, some of our recent topics will also be discussed.

Biography: Dr. Kazutaka Yamamoto is a food scientist and technologist, focusing on food safety and high hydrostatic pressure (HHP) food processing. He received his Ph.D. in food engineering in 1994 and then joined the Ministry of Agriculture, Forestry and Fisheries as a technical officer. He was appointed to then National Food Research Institute (currently the Institute of Food Research, NARO). He started to work on HHP as he worked as a postdoc at the Institute of Food Science, Swiss Federal Institute of Technology, Zurich (ETH Zürich).

Emerging process technologies for more sustainable protein-rich food and feed: Insights from international public-private partnerships

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Keywords: Sustainability, algae, insects, emerging processing

Abstract

Innovations in food systems are pivotal for achieving the 17 Sustainable Development Goals (SDGs). Given the broad scope of these goals, holistic frameworks are required to integrate traditionally siloed sustainability assessments and catalyze systemic change. This study presents a multi-indicator sustainability assessment designed to quantify the performance of food systems, products, and services. A key finding is that integrating nutritional quality is essential for equitable assessment; our data highlight an urgent need for nutritionally equivalent, sustainable alternatives to animal-based food and feed. Economic feasibility remains a critical barrier, requiring strategies to improve scalability and achieve economies of scale while reducing capital (CAPEX) and operational expenditures (OPEX). Applying this framework, we propose two science-driven solutions: the use of polyextremophilic microalgae for human nutrition and black soldier fly larvae (BSFL) for circular feed systems. The nutrient-dense microalga *Galdieria sulphuraria* thrives at low pH (0–3) and high temperatures (up to 56°C), effectively inhibiting microbial contamination. This selective environment reduces decontamination costs, simplifies processing, and facilitates continuous cultivation using circular residue streams. Furthermore, the application of emerging nanosecond pulsed electric field (nsPEF) stimulation increased biomass productivity by 20–40% compared to controls, significantly lowering CAPEX and OPEX.

In food applications, heterotrophic microalgae-based meat substitute production by high moisture extrusion—incorporating up to 50% yellow microalgae protein concentrate—demonstrated superior micronutrient profiles (Vitamins E, B1, B2, B3, and B6) compared to soy. For feed, resilient BSFL effectively upcycle organic waste into high-quality feed in both urban and rural contexts, supporting sustainable livestock production in developing regions. Collaborative initiatives with industry partners and start-ups confirm the scalability, impact, and industrial relevance of these innovations.

Short BIO

Prof. Dr.-Ing. Alexander Mathys is food technologist and received his doctoral degree in food processing in 2008. He is Professor in Sustainable Food Processing at ETH Zurich and Singapore-ETH Centre, where he is working on more efficiency and sustainability of value chains in food and feed. Dr. Mathys acts as President of the Swiss Academy of Sciences National Committee of IUFoST and is International Academy of Food Science and Technology (IAFoST) Fellow since 2024. Dr. Mathys is the author of more than 200 publications, including 10 book chapters, and 13 patents. He was winner of the ETH Zurich Dandelion Entrepreneurship Award 2022 and International Institute of Food Technologists Food Security Award 2020. In 2010 he was selected as “Young Researcher” at the 60th Meeting of Nobel Laureates in Lindau.

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