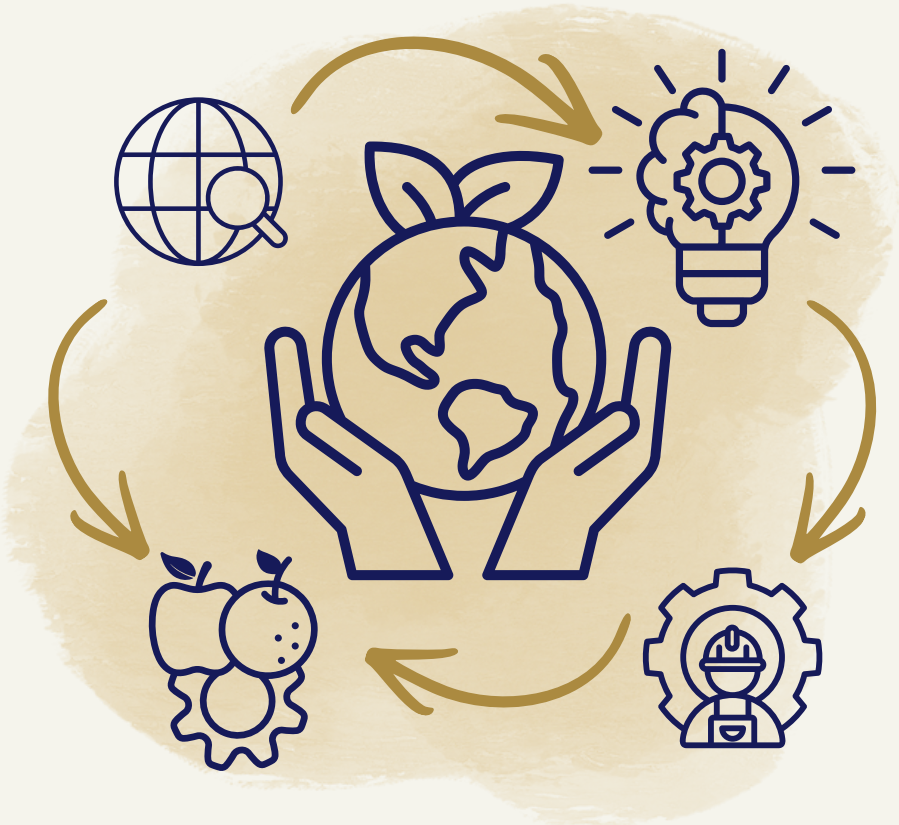
IFIS 2026

INTERNATIONAL FOOD INNOVATION AND SUSTAINABILITY CONGRESS



ABSTRACT BOOK

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PREFACE

Sustainability has become one of the foremost priorities for nations, corporations, and individuals in today's world, and its significance continues to grow steadily. The concept of sustainability, one of the most important notions of our time, was officially recorded for the first time in 1987 with the publication of the Brundtland Report (Our Common Future). Prepared by the United Nations World Commission on Environment and Development, this report defined sustainable development as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." To understand how far behind we are today in terms of sustainability, it is enough to look at the Earth Overshoot Day over the years. While in 1971 it fell on December 25, in 2025 it has unfortunately moved up to July 24. According to recent data, 30–35% of food produced (1–1.3 billion tons) is wasted, leading to an economic loss of 1 trillion dollars. On the other hand, while food waste is so high, nearly 890 million people worldwide still lack access to sufficient food. Considering that the world's population is expected to reach 9.8 billion by 2050, food waste will pose even greater challenges to food security in the future.

The food sector is experiencing one of the most critical periods in its history. The growing global population, the pressure of climate change on agriculture, food waste, and rapidly depleting resources compel us to move beyond traditional methods. Producing food is no longer merely an engineering matter; it is also a matter of responsibility toward our planet. With this awareness, the 2nd International Food Innovation and Sustainability Congress, organized by the Department of Food Engineering at Yildiz Technical University, was held on 7–9 May 2026 at Yildiz Technical University in Istanbul, Türkiye. The congress has served as a significant platform where leading scientists and industry stakeholders from both Türkiye and abroad convened to exchange current knowledge, foster dialogue, and establish new collaborations in the field of food innovation and sustainability.

Under the theme of food innovation and sustainability, a wide range of significant topics—including food technology, waste valorization, plant-based alternative proteins, green technologies, artificial intelligence and machine learning, as well as approaches to waste utilization—were presented and shared through oral and poster sessions at our 2nd IFIS Congress. Approximately 300 participants from both academia and industry attended our congress. A total of 197 presentations were delivered, comprising 86 oral and 111 poster sessions, in which valuable, informative, and up-to-date studies were shared. In addition, 11 distinguished invited speakers presented their significant research contributions. The participation of representatives from 9 different countries further enhanced the international character of the congress. Moreover, the presence of participants from 33 companies and 64 universities underscored the importance of strengthening university–industry collaboration, facilitating the exchange of current knowledge, and fostering new national and international partnerships. Compared to 2024, a notable increase in international participation was observed, which clearly reflects the progress of our congress. Enhancing this level of international engagement remains among our key objectives for the future.

IFIS 2026

PREFACE

The sponsors undoubtedly stand among the most significant stakeholders of such a large and successful event. We hereby extend our profound gratitude to the sponsors listed below, who have supported us with their invaluable financial and moral contributions.

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Preparations for the congress commenced on 23 July 2025, and throughout this process we worked with great dedication. I would particularly like to express my sincere gratitude to **Dr. Rusen Metin Yıldırım**, **Dr. Duygu Ozmen**, and **Sevda Dere**, who have contributed immense effort and dedication to the organization of the congress. I also wish to extend my thanks to Dr. Omer Simsek, whose continuous support was invaluable, as well as to Dr. Salih Karasu, Dr. Osman Sagdıc, our department chair, Dr. Hasan Cankurt, and Dr. Hakan Basdogan for their significant contributions to the organization of the congress. As in every major event, there are individuals who stand at the forefront, but equally important are those who, often unseen, fulfill every responsibility entrusted to them with precision and dedication. In this regard, I am deeply grateful to Kader Korkmaz Edis, Dora Mutlu, and Oznur Saroglu, together with Dr. Selma Kayacan Cakmakoglu, Dr. Perihan Kubra Akman, Dr. Muhammet Ozgolet, Burcu Mine Kıymaz, Dr. Eylul Ozturk, and Dr. Betul Bay Yılmaz, all of whom served diligently on the organizing committee.

Furthermore, I would like to extend heartfelt appreciation to the undergraduate and graduate students of Yildiz Technical University—Fatma Betul Sarikaya, Sudenaz Yarma, Ece Nur Yuksel, Pelin Su Selimcik, Aycanur Sancak, Elif Rüveyda Sahin, Yaren Ates, Melis Babacan, Nisa Yoney, Azra Dila Kucukikiz, Zehra Ocal, Yagmur Karaguzel, Tugba Nur Caglar, Elif Ozdemir Bas, Rana Cıtak, Muhammed Eren Karakas, Kubilay Duri, Hasan Atalay, and Ahmet Enes Kayacan—who contributed selflessly and without expectation, and who will undoubtedly continue to play an important role in the future of this significant event.

I am also profoundly grateful to our Rector, Dr. Eyup Debik, the General Manager of Yildiz Technopark, Dr. Muhammet Garip, and the Dean of the Faculty of Chemical and Metallurgical Engineering, Dr. Musa Turker, for their unwavering support throughout the congress. Finally, I wish to extend special thanks to Dr. Murat Turhan and his team, whose presence and contributions were of great importance during the organization of the congress.

If we liken the activities carried out during the organizational process of our congress (IFIS Congress) to nurturing a tree, then the fruits of this tree may be regarded as our participants. Accordingly, we must always bear in mind that the true value of our congress derives from its participants. We therefore extend our heartfelt gratitude to all those who attended, supported, and enriched the congress by sharing their academic and industrial expertise and experiences, and by standing with us throughout this endeavor.

We look forward to meeting again at the 3rd IFIS Congress in 2028.

With Best Regards,

Dr. Omer Said TOKER

Reimaging Space Food with Aquatic-Derived Ready-to-Print Formulations

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Space foods are designed to meet the crew's nutritional requirements and maintain their well-being during missions. Microgravity, radiation, and low atmospheric pressure, along with waste and storage management in a very limited area, push the limits of traditional food production. Three-dimensional (3D) printing is an additive manufacturing technology in which liquid or semi-solid formulations consisting of edible components are transformed into solid foods of various shapes and sizes by adding them layer by layer through a nozzle. If the function of 3D-printed food can change in response to stimuli such as time and heat, it is redefined as 4D-printed food. They are dry-printed, expand upon rehydration to become ready for consumption, or become palatable through thermally triggered gelation. On the other hand, multi-axial 5D-printed foods are not prioritized for robust, adjustable porosity intrinsic microstructures. 6D-printed foods, which highlight the time-dependent functionality of multi-input smart geometric structures, aim to effectively release active biological ingredients from the printed food into the gastrointestinal system through encapsulation. 7D-printed foods, with biomarkers embedded in their formulations, facilitate simultaneous health-status monitoring in settings where medical services are limited. In all printing systems, bioink is a key component that determines both the printability and the nutritional and functional value of food. Algae-based bioinks contain omega-3 fatty acids, antioxidants, and bioactive peptides, enabling the design of printed foods that are strategically engineered to address key physiological challenges in space conditions. For instance, calcium and protein-dense bioinks to counteract muscle atrophy and bone loss under low gravity, astaxanthin-abundant bioinks to mitigate radiation-induced oxidative stress, and peptide-based bioinks to support circadian rhythm regulation and psychological health of crew in a closed-loop life support system. Consequently, algae-based bioinks can reshape space nutrition from static, pre-packaged supplies into dynamic, functional, and personalized ones that are also sensory-acceptable.

Keywords: Ready-to-print food; Space food; Algae-based bioinks; 7D printing