"Application of robotics, smart sensors, AI, IoT & Big Data are enablers of the future food processing innovations"

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In an era where the food and beverage industry is at the crossroads of innovation and sustainability, Dr Abhishek Chandra, Assistant Professor at the School of Health Sciences and Technology, UPES, shares valuable insights with NUFFOODS Spectrum on transformative trends shaping the global food technology landscape. From alternative proteins and personalised nutrition to reducing food waste and embracing cutting-edge technologies like 3D food printing, Dr Chandra delves into how these advancements address critical challenges such as food security and environmental sustainability. Edited excerpts:

What are some of the most transformative trends currently shaping the food technology landscape?

Innovative technologies like nutraceuticals, alternative proteins, and other emerging food technology trends offer practical solutions by lowering the cost and increasing the accessibility of nutrient-dense food. In contrast to conventional animal-based food, alternative proteins, for example, provide sustainable and less resource-intensive sources of nutrition. Even in lower income regions, nutraceuticals—fortified foods and supplements—improve diet quality while preventing nutritional deficits. These developments not only improve environmental sustainability but also food security.

Can you elaborate on innovations in food waste reduction and upcycling? How are these practices being adopted by industries worldwide?

Technologies like smart food packaging with sensors to track freshness, dynamic pricing based on nearing expiration dates, using food waste to make new products like baked goods or protein powders, and designing anaerobic digestion systems that convert food waste into biogas are examples of innovations in food waste reduction and upcycling. Businesses are embracing these practices by incorporating them into their supply chains, collaborating with food recovery organisations, and marketing and upcycled products to consumers as a sustainable choice. Emerging technology, however, is an integral part of the solution. Currently, many technologies are being used to manage food waste, such as AI to optimise food distribution and consumption patterns, IoT devices to monitor and reduce waste in the supply chain, and composting systems. Food waste is effectively separated and processed for recycling or energy production by smart bins and waste sorting technologies.

What unique career opportunities are available for B.Tech. graduates in food technology, particularly in roles like sustainable food technologist or food data scientist?

A B.Tech. in Food Technology opens doors to unique career paths like sustainable food technologist, food data scientist, food process engineer in food processing companies, quality control laboratories, regulatory affairs specialists for sustainable food labelling, research scientists in areas like alternative protein development and they can even establish their food-related ventures. As a sustainable food technologist, they may develop food production processes that minimize waste, reduce water usage, and utilise renewable energy sources.

Analyse the life cycle impact of food products and identify areas for sustainability improvement. Also, they can collaborate with farmers and food manufacturers to implement sustainable practices. A food data scientist can apply data analytics to predict consumer trends, explore areas for efficiency enhancements, and optimise food manufacturing processes. They also work on developing predictive models for managing inventory levels and estimating food demand. They also analyse large data sets on sustainability, quality, and food safety metrics.

With innovations like 3D food printing and personalised nutrition, what opportunities exist for entrepreneurial ventures in food technology?

Innovations like 3D food printing could be advantageous for every entity involved in the food chain, including on-demand food production, consumer-centric approach adoption, innovative food perceptions, satiety control, food loss reduction, customised sensory products, digital food manufacturing transition, and new business creation. Numerous food technology-related entrepreneurial ventures may arise from it, such as space food, elderly food, decentralised food production, innovative food design, sustainable food production, personalised nutrition, and commercial innovation.

What specialised skills or certifications should food technology students acquire to enhance their employability in emerging sectors?

To enhance employability in emerging food technology sectors, food technology students should focus on acquiring specialised skills in areas like food safety and quality assurance (including HACCP certification), Knowledge of international food safety standards like BRC, SQF, FSSC 22000, expertise in allergen management, proficiency in laboratory techniques like HPLC, GC-MS, PCR, and near-infrared spectroscopy, sensory evaluation and consumer testing skills, food product development, nutritional labelling.

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How is UPES collaborating with the food industry to provide practical exposure and real-world problem-solving opportunities for its students?

To collaborate with the food industry, UPES offers an industry-aligned curriculum in its Food Technology programme. This curriculum ensures graduates possess the necessary skills to readily contribute to the food sector. This provides students with practical exposure through industrial training, internships, and on-site visits to food processing plants, enabling them to solve real-world problems and gain firsthand experience in the food sector. Additionally, UPES partners with leaders in the food industry and research institutes to bring in expert guest lectures and mentorship opportunities for students to learn from professionals in the field.

With the anticipated population growth of 9.7 billion by 2050, what role will food technologists play in achieving food security on a global scale?

To feed the projected 9.7 billion people by 2050, food technologists will play a critical role in developing innovative technologies that will increase food production, improve food quality and nutritional value, minimise food waste, and adapt to changing climate conditions. The developments in various food technologies for industries include digital transformation and process automation of the food processing industry. Application of robotics, smart sensors, Artificial Intelligence, the Internet of Things, and Big Data as the main enablers of the future food processing innovations. It offers advantages in terms of production efficiency (using Big Data to estimate demand), safety (using the Internet of Things to connect sensors and devices), and quality control (using robotics and artificial intelligence, for example, to sort during processing).

Key areas where food technologists can contribute include Alternative protein sources, Food preservation and waste reduction and Nutritional fortification and enhancement. NS

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