FOOD INDUSTRY 4.0 – NOVEL AND EFFICIENT FOOD PROCESSING

THE TOOLS FOR A FUTURE PROOF FOOD SYSTEM

FOOD 2030: NUTRITION, CIRCULARITY, INNOVATION

New approaches for sourcing, processing and manufacturing systems for foods and food ingredients are constantly on the rise. Several sector-specific technologies are emerging; common goals across this innovation area include reducing environmental impact and increasing nutritional quality while maintaining food safety, and the enjoyable experience of consuming food.

SPECIFIC R&I BREAKTHROUGH TOPICS

Novel and efficient food processing includes all steps from cutting and separation of agro and aqua resources, stabilisation of new food structures and products, meal assembly and home cooking. In all stages, new innovations have been taking place, from cutting technologies (water-beam, laser, ultrasound), fractionation, separation and extraction (dry bio-refineries, membranes, adsorption technologies, electrostatic separation, hypercritical CO2), to structuring (emulgation utilising membranes, microfluidisation, ultrasound), and heating (super-heated steam, microwaves, induction, sous-vide, radio-frequency). Also, non-thermal and mild preservation (electromagnetic energy and pulsed electric fields, high pressure treatment, reverse osmosis, cold plasma), filling (aseptic filling, clean room tech, super cooling), and packaging (see packaging breakthrough).

For illustration, non-thermal and mild preservation technologies, like high pressure treatment, are under development to maintain the fresh-like quality of pasteurised and sterilised food, while also reducing energy input during processing. Dry biorefineries have a potential to separate and valorise the different fractions of resources in the agricultural production environment.

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The processing innovations have also been fuelled by new developments in digitalisation, robotisation and 3D-printing (personalisation, mass production, DIY). Plus, nanotechnologies (new formulations, new applications, novel packaging, novel foods, policies applied), system thinking (low input technologies, feedback and feedforward controls, novel sensing methods, etc). In addition, new ways of producing resources (eg via organic production, agro-ecological principles, urban or coastal farming and so on), consumption practices (eg consumer attitudes towards products and technologies, participatory actions, new food preparation schemes, food cultural heritage, etc).

EXPECTED IMPACT

There have been numerous innovations in food processing technologies recently, many of which are sector specific. In general terms, the food industry 4.0 strives to provide more efficient processes in productivity, energy and water consumption, with innovative processes targeted for a wider variety of foods including traditional foods, for more environmentally sustainable processes. These can be achieved with less waste, products of higher nutritional quality, and targeted meal compositions. In many cases it also implies higher productivity or lower production costs. It should be noted that such considerations should go hand in hand with the notion of maintaining, as much as possible, the naturally rich and diverse quality characteristics of resources, so without artificial interventions or over-dimensioned manufacturing steps.

MARKET OPPORTUNITIES / CHALLENGES

- All processing equipment that requires less inputs and avoids losses supports more eco-friendly manufacturing.
- Highly flexible technologies that can be used for either delocalisation and scaling of processing (in the field, at home), or in reduction of time resources.
- Reverse engineering tools that can be used as starting points for meeting consumers' preferences and needs. Also, new participatory co-creation pathways can be developed to bring producers and consumers closer together.
- Digitalisation of processing and utilisation of artificial intelligence will help people make better environmental choices, steering manufacturing processes, and helping consumers to get insights into food processing. This is a typical cross-sector operation.
- Food fermentation technologies due to increasing insights in microbiology that permit the development of new healthy and sustainable products.
- Revival of artisanal and local food processing schemes that enhance the richness of the European food culture.

EXAMPLE REFERENCES

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ASSOCIATED TRENDS IN FIT4FOOD2030 (URL)

- Rise in energy consumption
- Industry 4.0 - digitalisation in food production
- Big data analysis
- New technologies in food production
- High/ultra-processed food
- Novel food
- Natural preservatives and milder processing methods
- "Free from" products
- Packaging 4.0

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- Food waste recovery up-cycling/ waste cooking
- Food regulation

ASSOCIATED CASES IN FIT4FOOD2030 (URL)

- Apeel
- Doux Matok
- Geltor
- Toast Ale
- Kiverdi
- Ecoberries by CoreOrganic

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