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Highlights:

- Food Science and Technologists jointly contribute to sustainable and circular food systems
- Food Science is a unique science domain addressing all complex system elements
- Evidence-based food science cases provide *tasteful* options for policy making, also in times of uncertainty.

Abstract

Food science and technology substantially contributes to food systems striving for more sustainable outcomes. This is shown at the annual EFFoST conferences and in food science oriented journals, even though perceptions may be different; the latter requires a more active involvement in current societal debates. Food science is in particular well-suited to contribute to more sustainable solutions because it deals with all elements of complex systems as well as with the environmental, social and economic dimensions of sustainability. This is due to its scientific and practical approaches, hence enabling to provide ingredients for policy making and innovation.

Introduction

The year 2020 followed an extremely unexpected course, bringing sadness and difficult living and working conditions to many of us. With the hope that 2021 will rebalance our quality of life, I would like to share some reflections about the contribution of Food Science and Technology to create more sustainable food systems as the newly elected President of the European Federation of Food Science and Technology (EFFoST, 2021a).

At the past EFFoST conferences and in our affiliated journals, namely Trends in Food Science (TIFS), Innovative Food Science and Emerging Technologies (IFSET), Food Control, and Taste of Science, I am delighted to see your passion for food science and technology, your creative ideas and innovations, and willingness to collectively contribute to more sustainable food systems.

Perception, Criticism and Debates

This is highly appreciated since the general public's perception of food science and technology is not always positive (e.g. EUFIC, 2016; and references therein), witnessed in the discourses on ultra-processing, unhealthy food products, food waste and spoilage, environmental impact of food packaging materials, some less-appreciated preservation means and so on. In some countries, the phrase 'novel technologies' is banned from strategic research agendas while others strongly support the development of these technologies. This then raises the question whether the criticism on food science and technology is based on scientific facts? Is the debate being constructive for example by providing realistic and accepted alternatives? Who is criticizing and what is her/his knowledge about our domain and what are their invested interests? What is apparent, is that we as experts need to be even more visible in these debates, hence the ambitions of Young EFFoST, some of our Standing

Committees, Working Groups and our Special Interest Groups like the Global Harmonization Initiative. They welcome societally engaged colleagues willing to contribute to these debates.

Towards more sustainable food systems

Since constructive criticism is an essential driver of scientific progress, scientists need to be willing to have their work critiqued and review the work of their colleagues to raise the field of food science and technology to greater heights. If we do not learn from our experiences and from each other, we will stand still and not move towards more sustainable food systems. This is needed as a famous saying goes '*If you do not change direction, you may end up where you are heading*' (Lao Tzu). It is therefore interesting to note that both young – like our highly dynamic Young EFFoST team – and 'many years young' scientists within the EFFoST community are continuously seeking solutions that are more sustainable. Examples include preserving biodiverse and healthy foods in a milder way; utilizing more environmentally friendly packaging; and developing tracking and tracing tools in order to care for the safety of food products and so on (Knorr et al., 2020). Recently, three EFFoST Working Groups were initiated on Sustainable Food, Health & Food and Digital Food to further the discussion on these subject matters based on scientific evidence (EFFoST, 2021b).

Joint actions

Today, circular economy concepts are debated as one way of reaching more sustainable outcomes[1] (Korhonen et al., 2018), in particular acknowledged in the agri-food domain for closing nutrient cycles. During my mathematics courses, I learnt that a circle has neither a beginning nor an end with all points equally distanced to its centre. This implies that all actors at the arc of the circle are connected and, thus always confronted with the outputs of their own actions. In other words, citizens in their various roles both demand (consumers of goods and services) and supply (providers of goods, services and waste) inputs. Also as stated before, all actors are positioned at the same distance to the centre of the circle, thus having a fairly equal role to play, which could even be considered democratic; this may be questioned for linear (value) chains.

Collective, fair and respectful actions are needed to solve problems and end up with better solutions, I deem this the most sensible way forward. Joint projects representing different organizations in different countries provide good opportunities for collaboration, like in the European Horizon2020 projects, Bio-Based Industry Joint Undertakings projects (BBI, 2021), national and local projects. EFFoST is highly active in quite a number of these projects (EFFoST, 2021c). As a project partner we enable public and private partners to connect with food scientists at our events, to close cycles. We also intend to encourage them to join our Standing Committees, like the one on innovation, to provide their unique perspective. Collaboration is needed, because we all realize that we are both part of the problem and of the solution. This realisation, however, does not need to interfere with our credibility as independently thinking (public and private) researchers seeking well-founded knowledge.

Recognition of Food as a Science domain

I am astounded that food science and technology is not a recognized 'scientific field' in many countries. This is hard to understand from a societal standpoint, if one realizes that (i) by far the majority of consumed foods are processed renewable resources (EC, 2021) – needed from e.g., a

[1] In real life, one can better speak about helices allowing systems to evolve in time.

safety, swallowing or digestibility point of view; all non-trivial issues – and (ii) food is both a primary need, commons, and right for all (Jackson et al., 2021), which poses numerous questions.

From a scientific perspective it is also impossible to explain. Food systems are highly complex (de Vries et al., 2018), if one considers the seven elements of systems (or building blocks of game theory), namely playing fields (specific food areas), players (stakeholders), pieces (products), moves (transformation steps), rules (legislation and incentives), outcomes (win-lose like healthy or unhealthy, sustainable or unsustainable, etc.), and time (from start till outcome). In food science and technology, one is dealing with a wide range of dynamic 'playing fields' with a variety of transformative moves – from harvest, processing, preparation, consumption till digestion – resulting into diverse food products. These are subject to changing rules and constraints like safety measures or subsidies. Trajectories are explored by various 'players', like public and private stakeholders who seek knowledge to reach specific 'outcomes' e.g. functionalities, healthiness, desirability, affordability, accessibility, and availability. Consequently, our domain deals with complex process-structure-function relationships (Fischer & Windhab, 2011) spanning the lifetime of resources moving to and along the digestive tract (Dupont et al., 2019). This is in essence not different from material science, ecology, economics, etc. that also deal with a high level of complexity in which objects or species face (extreme) conditions in their struggle for resilience, adaptability and emerging properties. If one considers sustainable food systems as a key priority to respond to climate change, biodiversity loss and food related diseases, then food science and technology logically deserves a place as a science domain on (inter)national agendas, like for example at the UN Food Summit 2021 (UN, 2021).

Science-Policy interfaces in times of uncertainties

Since we are frequently confronted with the science – policy interfaces in our work, food as a science domain is even more relevant today (SAPEA, 2020). Policy makers ask for precise and preferably quantified recommendations and indicators that can be immediately used and translated into policy measures. Moreover, we also need to contribute to a viable planet with complex adaptive (food) systems that are resilient, adaptive and socially fair. This challenge is characterized e.g. by highly non-linear behaviour and subject to the Heisenberg principle of uncertainty as I have learnt as a physicist. Thus, in this new normal, we all, politicians, entrepreneurs and scientists alike have to live with the uncertainty and unpredictability of time and place. Consequently, scientists cannot propose 100% accurate recommendations; however, we still can come up with the most relevant options for policies based on state-of-the-art scientific outcomes. This is what we, as EFFoST, try to do by contributing to the Working Groups on Food Systems of the Standing Committee on Agricultural Research (SCAR and SCAR Foresight), the Science Advice for Policy making of European Academies (SAPEA, 2020), the EU Food2030 agenda, the ERANET SUSFood program, the Joint Programming Initiatives like A Healthy Diet for a Healthy Living, Foodforce network, ISEKI network, the European Technology Platforms like Food for Life, etc[2].

Contributions to policy options

Our contributions to policy options are evidence-based and often rely on cases, thoroughly tested

[2] For more information: https://scar-europe.org/index.php/food; https://ec.europa.eu/info/research-and-innovation/research-area/food-systems/food-2030_en; https://susfood-db-era.net/main; https://www.healthydietforhealthylife.eu/; https://www.foodforcenetwork.eu/; https://www.iseki-food.net/; https://etp.fooddrinkeurope.eu/

and analysed for their outcomes (positive or negative; see for example the special issue edited by Taoukis & Matser (2021)). An example is the search for specific alternative protein foods – preferably produced via agro-ecological practices – without fully stepping away from animal or marine proteins. Other examples include spoilage reduction, valorisation pathways for by-products and waste, and the assessment of environmental, social or economic trade-offs for healthier diets. The three dimensions of sustainability are particularly well represented in the solutions provided by food science and technology in projects namely: the eco-friendliness of all transformation steps (environmental); the preferences, acceptance and needs (social); and the creation of added value (economic). Remarkable projects, showing scientific creativity and societal relevance are awarded by EFFoST and our partners at the annual conference. Here, all interested stakeholders are warmly welcome including policy makers.

Ingredients of life

In our fascinating real and dynamic world, Food Science and Technology will continue to fuel us with diverse and challenging questions that require new knowledge and know-how, not only for experts in laboratories and production plants, but also at home. Anyone who cooks and consumes, or even stores food in their fridge, could be considered a food engineer. Therefore, we remain inspired by the surprisingly wonderful tastes that nature offers and potentially new food, drinks and diets consumed in beautiful green and blue environments, either urban, rural or marine. As EFFoST we collectively hope to provide a modest but scientifically passionate contribution to the challenges of today and tomorrow, not just for the happy few, but for *all in a changing world*.

On behalf of the EFFoST Board, our best wishes to all of you for 2021 and beyond, both in your private life and at work.

Hugo de Vries,

President of the European Federation of Food Science and Technology

P.S. The **35th EFFoST International Conference: Healthy Individuals, Resilient Communities, and Global Food Security** will held in the city of Lausanne in Switzerland from 1-4 November 2021. We would like to invite you to submit abstracts for oral and poster presentations on the conference topics via the abstract submission system. Submission deadline is 23 April 2021 (EFFoST, 2021d).

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