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Hugo de Vries

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1 **Food science and technology contributes to sustainable food systems**

2 Hugo de Vries, President of the European Federation of Food Science and Technology (EFFoST)

3 INRAE – French National Research Institute for Agriculture, Food and Environment, UMR IATE (University of
4 Montpellier, INRAE, Institut Agro), 2 Place Pierre Viala, 34060 Montpellier, France

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6 **Highlights:**

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

11 **Abstract**

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

19 **Introduction**

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

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

29 **Perception, Criticism and Debates**

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

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

42 **Towards more sustainable food systems**

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

55 **Joint actions**

56 Today, circular economy concepts are debated as one way of reaching more sustainable outcomes¹
57 (Korhonen et al., 2018), in particular acknowledged in the agri-food domain for closing nutrient
58 cycles. During my mathematics courses, I learnt that a circle has neither a beginning nor an end with
59 all points equally distanced to its centre. This implies that all actors at the arc of the circle are
60 connected and, thus always confronted with the outputs of their own actions. In other words,
61 citizens in their various roles both demand (consumers of goods and services) and supply (providers
62 of goods, services and waste) inputs. Also as stated before, all actors are positioned at the same
63 distance to the centre of the circle, thus having a fairly equal role to play, which could even be
64 considered democratic; this may be questioned for linear (value) chains.

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

76 **Recognition of Food as a Science domain**

77 I am astounded that food science and technology is not a recognized 'scientific field' in many
78 countries. This is hard to understand from a societal standpoint, if one realizes that (i) by far the
79 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.

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

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

101 **Science-Policy interfaces in times of uncertainties**

102 Since we are frequently confronted with the science – policy interfaces in our work, food as a science
103 domain is even more relevant today (SAPEA, 2020). Policy makers ask for precise and preferably
104 quantified recommendations and indicators that can be immediately used and translated into policy
105 measures. Moreover, we also need to contribute to a viable planet with complex adaptive (food)
106 systems that are resilient, adaptive and socially fair. This challenge is characterized e.g. by highly non-
107 linear behaviour and subject to the Heisenberg principle of uncertainty as I have learnt as a physicist.
108 Thus, in this new normal, we all, politicians, entrepreneurs and scientists alike have to live with the
109 uncertainty and unpredictability of time and place. Consequently, scientists cannot propose 100%
110 accurate recommendations; however, we still can come up with the most relevant options for
111 policies based on state-of-the-art scientific outcomes. This is what we, as EFFoST, try to do by
112 contributing to the Working Groups on Food Systems of the Standing Committee on Agricultural
113 Research (SCAR and SCAR Foresight), the Science Advice for Policy making of European Academies
114 (SAPEA, 2020), the EU Food2030 agenda, the ERANET SUSFood program, the Joint Programming
115 Initiatives like A Healthy Diet for a Healthy Living, Foodforce network, ISEKI network, the European
116 Technology Platforms like Food for Life, etc².

117 **Contributions to policy options**

118 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/>

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

130 **Ingredients of life**

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

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

141 Hugo de Vries,

142 President of the European Federation of Food Science and Technology

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

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154
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