

# Multidisciplinary Program on Sustainable Food and Biomass Systems

## Background

The world faces enormous challenges of supplying food and biomass in a sustainable manner under the escalating pressures of climate change, environmental degradation and population dynamics<sup>1</sup>. In addition, Covid19 was a reminder that the world needs to be better prepared for next pandemics of human, animal and plant diseases as well as other disasters that can disrupt food supplies. Part of that preparedness will be to complement existing food systems with sustainable local food systems.

Addressing these challenges requires transformative change and unprecedented innovation<sup>2</sup> as well as integrated strategies for sustainable food and biomass systems. On the EU-level such integrated initiatives include the [European Green Deal](#), the [Farm to Fork Strategy](#), the [EU 2030 Biodiversity strategy](#), “[Food 2030](#)” and the July 2020 European Council decision on the [Recovery Plan](#).

Critical to successful development and implementation of integrated strategies for sustainable food and biomass systems is that they are multidisciplinary, based on evidence and impact assessment, developed in a transparent and inclusive manner, including developing country perspectives.

## The VUB Multidisciplinary Program on Sustainable Food and Biomass Systems

In the context described above, the Vrije Universiteit Brussel (VUB) has established a program to support the preparation and execution of multi-disciplinary research and education projects on sustainable food and biomass systems<sup>3</sup>.

While these projects will vary in nature, they will have several common characteristics, such as:

- a. *multi-disciplinary and integrative*: drawing upon all relevant disciplines and strengthening synergy between education and research
- b. *collaborative and open*: developed and conducted in collaboration between universities and research institutes in the EU and beyond, in consultation with other relevant organisations, and applying to the extent possible the concept of Open Science.
- c. *Evidence based and results-oriented*: aimed at providing decisionmakers and other stakeholders with substantiated, tangible tools to make informed decisions, including decisions that involve ‘trade offs’ between different aspects of sustainability.
- d. *Serving a broad audience*, including researchers, educators, students, policy makers in national, EU and international organisations, private sector actors, farmers, and the general public.

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<sup>1</sup> See for example the FAO [Annual State of Food and Agriculture 2019](#), the [2019 report of the Intergovernmental Panel on Climate Change](#), the [2019 report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services](#), the [2019 report of the World Meteorological Organisation](#), the 2020 [5<sup>th</sup> Global Biodiversity Outlook](#), and the 2 December 2020 statement of the UN Secretary General on the [State of the Planet](#).

<sup>2</sup> See for example the [2019 report of the Global Commission on Adaptation](#), the March 2020 report of the Group of Chief Scientific Advisors: “[Scientific opinion - Sustainable food system](#)” the OECD [Strengthening Agricultural Resilience in the Face of Multiple Risks](#), the September 2020, IUCN report on agriculture: [Common Ground: Restoring Land Health for Sustainable Agriculture](#) and the outcome of the UN Heads of State and Government Summit on Biodiversity (September 2020).

<sup>3</sup> Sustainability under this program means aimed at contributing to one or more Sustainable Development Goals (SDGs), and includes environmental, human health, economic, and social aspects. See also for example the [FAO Strategic Objectives](#)

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The program will provide support to the development and execution of the multidisciplinary projects by:

- Bringing together a consortium of interested research and education groups at universities and public research institutes<sup>4</sup>. See Annex I for the current list of consortium members.
- Sharing with the consortium members suggested topics and cross cutting aspects to be addressed in the projects. See Annex II for examples.
- Preparing proposals for multi-disciplinary projects and promoting coherence between the projects. See Annex III for projects considered or in preparation.
- Conducting outreach activities. See Annex IV for suggested topics for outreach events.
- Connecting with national-, regional and international organisations to share information and views relevant to the program and the projects.
- Assisting, through collaboration with specialised departments, with the identification of potential budgets and application for funding.

The modus operandi of the program will be as follows: When there is a convergence of suggestions from consortium members and/or other organisations for a multidisciplinary project, the program leadership will produce a brief outline for a project and discuss that with the departments specialised in funding. If these departments assess that there are realistic avenues to obtain funding, then the outline will be sent to the consortium members, with the invitation to indicate interest and relevant expertise. When there is sufficient interest and expertise among consortium members, then the program leadership will draft a full project proposal in collaboration with interested consortium members and funding departments. During the drafting process, other stakeholders (e.g. organisations and private sector) will be approached to explore collaboration. After finalisation of the project proposal, the program leadership will work with the funding departments to submit the proposal.

### Contact

Feedback on the program and indications of interest in participation can be sent to: Prof. Piet van der Meer, Office of the Vice-rector for Research Policy, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussels, Belgium, [pieter.jan.van.der.meer@vub.be](mailto:pieter.jan.van.der.meer@vub.be).

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<sup>4</sup> While the consortium consists of groups at universities and public research institutes, other stakeholders can participate in the projects that will be developed and executed with the support of the program.

### Annex I: Consortium members.

The research and education groups listed below have indicated interested in participating in multi-disciplinary research and education projects on sustainable food and biomass systems. A detailed list with areas of expertise and contact details is available to the consortium members.

1. Institute for Plant Biotechnology and Cell biology, University of Natural Resources and Life Sciences, Vienna, Austria
2. Laboratory of Plant Genetics, Faculty of Sciences and Bioengineering Sciences, Vrije Universiteit Brussel, Belgium
3. Brussels Human Robotics Research Center, Vrije Universiteit Brussel, Belgium
4. Centre for Private and Economic Law, Law Faculty, Vrije Universiteit Brussel, Belgium
5. Social and Cultural Food Studies (FOST), Department of History, Vrije Universiteit Brussel, Belgium
6. MOBI research group, Vrije Universiteit Brussel, Belgium
7. Department of Hydrology and Hydraulic Engineering (IR-HYDR), Vrije Universiteit Brussel, Belgium
8. Department of Business – Marketing & Consumer Behavior, Faculty of Social Sciences and Solvay Business School, Vrije Universiteit Brussel, Belgium
9. Research group Microbiology, Faculty of Sciences and Bioengineering sciences, Vrije Universiteit Brussel, Belgium
10. Marine Biology (WE-DBIO), Faculty of Sciences and Bioengineering sciences, Vrije Universiteit Brussel, Belgium
11. Community Ecology (WE-DBIO), Faculty of Sciences and Bioengineering sciences, Vrije Universiteit Brussel, Belgium
12. Biology Department, Faculty of Sciences and Bioengineering Sciences, Vrije Universiteit Brussel, Belgium
13. Functional Ecology of Plants and Ecosystems (WE-DBIO), Vrije Universiteit Brussel, Belgium
14. Research Group of Industrial Microbiology and Food Biotechnology, Department of Bioengineering Sciences, Faculty of Sciences and Bioengineering Sciences, Vrije Universiteit Brussel, Belgium
15. Laboratory of Analytical, Environmental and GeoChemistry (AMGC), Faculty of Sciences and Bioengineering Sciences, Vrije Universiteit Brussel, Belgium
16. Multidisciplinary Institute for Teacher Education (MILO), Vrije Universiteit Brussel, Belgium
17. EnvEcon, Departement of Engineering Management, Faculty of Business and Economics, University of Antwerp, Belgium
18. PhotoBioCatalysis Unit at Crop Production and Biocatalysis Lab (CPBL)-Science, Biomass Transformation Lab (BTL)-EIB, Université Libre de Bruxelles, Belgium
19. Crop Nutrition Unit at Crop Production and Biostimulation Laboratory, Interfaculty School of Bioengineers, Université Libre de Bruxelles, Belgium
20. BioMatter – Research group for biomaterials and tissue engineering, Faculty of engineering, Université Libre de Bruxelles, Belgium
21. LL.M. in International Business Law, Université Libre de Bruxelles, Belgium
22. Pharmacognosy, Bioanalysis & Drug Discovery (PBDD), Faculty of Pharmacy, Université Libre de Bruxelles, Belgium
23. Plant Physiology and Molecular Genetics Laboratory, Faculty of Sciences, Interfaculty School of Bioengineers, Université Libre de Bruxelles, Belgium
24. Laboratory on Landscape, Urbanism, Infrastructures and Ecologies (LoUIsE), Faculty of Architecture, Université Libre de Bruxelles, Belgium
25. Agroecology lab, EIB, Université Libre de Bruxelles, Belgium
26. Laboratory of Applied Molecular Genetics, Department of Biotechnology, Faculty of Bioscience Engineering, Ghent University, Belgium
27. Department of European, Public and International Law, Faculty of Law, Ghent University, Belgium
28. Laboratory of Biochemistry and Glycobiology, Ghent University, Belgium
29. Department of Biotechnology, Faculty of Bioscience Engineering, Ghent University, Belgium
30. Center for Microbial Ecology and Technology, Department of Biotechnology, Faculty of Bioscience Engineering, Ghent University, Belgium
31. Centre for Synthetic Biology, Faculty of Bioscience Engineering, Ghent University, Belgium
32. Alliance of Bioversity International and CIAT Europe, Katholieke Universiteit Leuven, Belgium
33. Research at the Flanders Research institute for Agriculture, Fisheries and Food, Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Belgium
34. Living labs of the Flanders Research institute for Agriculture, Fisheries and Food, Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Belgium
35. Fisheries Biology, Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Belgium
36. Fisheries technology, Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Belgium
37. Aquaculture – mariculture, RAS, Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Belgium
38. Transversal activities in Applied Genomics, Scientific Directorate Expertise and Service provision, Sciensano, Belgium

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39. Service Biosafety and Biotechnology (SBB), Scientific Directorate Expertise and Service provision, Sciensano, Belgium
40. Group of Biotic Stress, Plant Virology, Agrobiointitute, Sofia, Bulgaria
41. Department of Agro-ecology Agricultural University of Plovdiv
42. Department of Plant physiology, biochemistry and genetics, Agricultural University of Plovdiv
43. department of Crop Management Systems, Crop Research Institute Czech Republic
44. Research Group Agricultural Systems and Sustainability, Department of Agroecology, Aarhus University, Denmark
45. Danish Centre for Rural Research, University of Southern Denmark
46. Laboratorio de Biotecnología Vegetal, Colegio de Ciencias Biológicas y Ambientales, Universidad San Francisco de Quito, Ecuador
47. Agricultural Genetic Engineering Research Institute (AGERI), Agricultural Research Center (ARC) Giza, Egypt.
48. Department of Agricultural Economics and Rural Development, University of Goettingen, Goettingen, Germany
49. Institute of Political Science, Heidelberg University, Heidelberg, Germany
50. Hohenheim Research Center for Bioeconomy, University of Hohenheim, Germany
51. Department of Physiology of Yield Stability, University of Hohenheim, Germany
52. Constitutional and Administrative Law, Public International Law, European and International Economic Law, University of Passau, Passau, Germany.
53. Veterinary Faculty, School of Health Sciences, Aristotle University of Thessaloniki, Greece
54. Faculty of Agriculture, Forestry and Natural Environment, Aristotle University of Thessaloniki, Greece
55. Food & Agriculture Foundation, Amity University Uttar Pradesh, Noida, India
56. Plant & AgriBiosciences Research Centre (PABC), Ryan Institute, National University of Ireland Galway, Ireland
57. Plant molecular Biology and Environment, Department of Science and Health, Institute of Technology Carlow, Carlow, Ireland
58. Centre for Research and Innovation, Quest International University Perak (QIUP), Malaysia
59. International and European Law, Faculty of Law Maastricht University, Netherlands
60. Maastricht Centre for European Law, Maastricht University, Netherlands
61. Food Claims Center Venlo, Maastricht University, Netherlands
62. Maastricht Working on Europe/Studio Europa Maastricht University, Netherlands
63. Institute for Agricultural Research Ahmadu Bello University, Zaria, Nigeria.
64. NTNU Food Forum, Norwegian University of Science and Technology, Norway
65. Institute of Plant Breeding, University of the Philippines, Los Banos College, Los Banos Philippines
66. Department of Polish and European Industrial Property Law, Institute of Law Studies, Polish Academy of Sciences, Warsaw, Poland
67. Department of Agronomy, Warsaw University of Life Sciences
68. Laboratory of Virology, Fruit Research & Development Station Bistrita, Romania
69. Institute of Field and Vegetable Crops (IFVC), Serbia, Institute of Field and Vegetable Crops (IFVC), Serbia
70. Crop Science Department , of the Agricultural Institute of Slovenia
71. Fruit Breeding Group, Instituto Valenciano de Investigaciones Agrarias (IVIA), Spain
72. Center of Agriculture and Engineering, Instituto Valenciano de Investigaciones Agrarias (IVIA), Spain
73. Center of Agrobiodiversity, University Polytechnic of Valencia (COMAV), Spain
74. Department of Plant Breeding, Swedish University of Agricultural Sciences (SLU), Alnarp, Sweden
75. Division Agroecology and Environment, Agroscope, Research, Zurich, Switzerland
76. FoodOmics Laboratory, Food Engineering Department, Hacettepe University, Ankara, Turkey
77. International Food Biosafety and Biotechnology Research and Extension Center, Hacettepe University, Ankara, Turkey
78. Crop and Natural Resources program; Livestock and Fisheries program; and Technology Promotion and Outreach program, Mukono Zonal Agricultural Research and Development Institute, NARO, Uganda
79. Crop Transformation Group , John Innes Centre, Norwich, UK
80. Institute of Biological, Environmental & Rural Sciences (IBERS), Aberystwyth University, UK
81. Innogen Institute, University of Edinburgh and The Open University, UK
82. Global Academy of Agriculture and Food Security, University of Edinburgh and The Open University, UK
83. Research and Innovation Department, University of Zimbabwe, Harare, Zimbabwe

## ANNEX II: SUGGESTED TOPICS AND CROSS-CUTTING ASPECTS

Communications with universities, research institutes and other organisations have confirmed great interest in collaborative research and education projects on sustainable food and biomass systems. In those communications many cross-cutting aspects as well as specific topics were suggested to be addressed in such projects.

In the table below, these suggested cross-cutting aspects and specific topics are grouped in the following areas: 1) Cross cutting aspects 2) Production, 3) Processing and Distribution, 4) Consumption and 5) Post consumption<sup>5</sup>.

The list below summarises the suggestions received and are intended to be a source of inspiration for, rather than a delineation of, projects. The table nor the groupings pretend to be comprehensive or fixed. Suggestions for additions, updates and/or fine tuning of the tables are warmly welcome. The full list with links and background documentation is available for the consortium members.

### 1) Cross cutting aspects

- a) General
  - i) Long term trends in food production and population dynamics
  - ii) Comparative impact of various systems
  - iii) Energy and natural resources use
  - iv) Economic and trade aspects
  - v) Socio-economic aspects
  - vi) Sustainability
- b) Governance
- c) Research and Innovation

### 2) Production

- a) Strengthening current farming practices
  - i) Agro-ecology
  - ii) Integrated Pest Management
  - iii) Digitalisation in agriculture
  - iv) Precision farming
  - v) Agro-forestry
  - vi) Robotics in agriculture and food production
  - vii) Phototonics in agriculture and food production
  - viii) Utilising Plant-microbe partnerships
  - ix) Improving Soil quality
  - x) Restoration agriculture
  - xi) Carbon Farming
  - xii) Sustainable Intensification
- b) Improving seed/ planting material
  - i) Seed security and diversity
  - ii) Long term trends in crop improvements
  - iii) Improving agronomic characteristics of plants
  - iv) Improving food quality characteristics of plants

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<sup>5</sup> A more detailed overview with further elaborations, references and background information is available to the groups listed in Annex I.

- v) Improving processing characteristics in plants
- vi) New breeding techniques
- c) Agriculture on marginal soils
  - i) Breeding crops for saline soils.
  - ii) Beneficial plant-microbe interactions
- d) Urban and peri-urban agriculture
  - i) City Region Food Systems
  - ii) Indoor-Vertical farming
- e) Floating farms
- f) Production through Fermentation processes
  - i) Fermentation to contribute to climate neutral economy
  - ii) Fermentation to address EU protein deficiency
  - iii) Cellular agriculture
- g) Animal breeding
- h) Improving fisheries and aquaculture
  - i) Comparative carbon footprint farmed fish and seafood
  - ii) Safeguarding aquatic genetic resources
  - iii) Sustainable fishery through new technological approaches
  - iv) Strengthening sustainable aqua-culture
  - v) Digitalisation in agriculture and fisheries
- 3) Processing and distribution**
  - a) Improving food-handling and processing
    - i) Improving food curing
    - ii) Improving food preparation techniques
    - iii) Sustainable seafood handling and processing
  - b) Shortening supply chains and improving distribution logistics
  - c) Alternative distribution systems
    - i) weekly markets, web services
    - ii) Local retailers
    - iii) Reverse logistics
    - iv) Farmgate sales
- 4) Consumption**
  - a) Long term trends in food consumption
  - b) Food chain safety
  - c) Improving current consumption patterns
  - d) Reducing over-consumption of protein and calories
  - e) Alternatives for current meat consumption - insects, weeds, and commercial fishing bycatch
  - f) Cultured meat
- 5) Post consumption**
  - a) Reducing food waste
  - b) Improving waste treatment
  - c) Reverse logistics

### Annex III – Proposed projects

Title and outline	Status
<p><b>1) Crop Improvement Compass</b></p> <p>The proposed project will produce a searchable populated with the following information per country: 1. Key commodity and specialty crops in the country 2. Current and anticipated challenges in growing and handling those crops.3. Current approaches to address those challenges 4. Crop improvement research aimed at addressing those challenges. Collecting and processing these data will be conducted in a multidisciplinary, standardised and strategic foresight fashion, and in consultation with relevant stakeholders, such as farmers from various farming systems, consumers, authorities, and other stake holders. With its unique approach, the project will deliver a significant ‘scale up’ in the utility of knowledge and data, and can become the preferred starting point for researchers, regulators, and producers to access the information and contacts they need for more rapid development and exploitation of improved crops.</p>	<ul style="list-style-type: none"> <li>• Potential funding call identified</li> <li>• Project outline circulated among consortium members with positive response</li> <li>• 25 confirmed project partners</li> <li>• Project proposal in preparation with project partners and funding departments</li> <li>• Submission date: 26 January 2021</li> </ul>
<p><b>2. Training program for multidisciplinary, integrative PhD projects in Life Sciences/bioeconomy.</b></p> <p>The proposed project aims at establishing a training and support program that assists prospective PhD students in the life sciences in broadening their Research &amp; Innovation (R&amp;I) by including multidisciplinary systems thinking, foresight planning, Open Science and impact assessment of their scientific research in relation to sustainable food systems .</p>	<ul style="list-style-type: none"> <li>• Project outline in preparation for discussion with funding departments</li> </ul>
<p><b>3. Curriculum ‘Sustainability Governance’</b></p> <p>The curriculum would offer multidisciplinary education and training on governance aspects relevant to sustainability, such as:</p> <p>1) understanding the science behind challenges to - and solutions for - sustainability,</p> <p>2) developing sustainability policies that are data driven and consistent with international obligations (e.g. the curriculum will include detailed introductions to various relevant international policy declarations, such as the SDGs, and relevant international agreements such as the Convention on Biological Diversity, the Aarhus Convention, and agreements under WTO),</p> <p>3) implementing the sustainability policies in a way that is evidence based, consistent with international obligations and transparent, and which includes multidisciplinary feasibility and impact assessment</p>	<ul style="list-style-type: none"> <li>• Project outline in discussion with universities and academia organisations</li> </ul>
<p><b>4. Assessment of the Farm to Fork Strategy goals.</b></p> <p>A multidisciplinary assessment of the feasibility of the F2F goals and of the environmental, economic and social impacts of the implementation of those goals.</p>	<ul style="list-style-type: none"> <li>• Project outline in discussion with universities, farming and environmental organisations.</li> </ul>

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### Annex IV - Suggested topics for debate events.

<p><b>Open Science</b></p>	<p>The European Commission website refers to Open Science as “a transition in how research is performed and how knowledge is shared”. The proposed debate will provide further background on Open Science, and the related concepts of Open Data and Open Scholarship, and discuss to what extent these concepts can make science more efficient, reliable, and responsive to societal challenges. A webinar outline in discussion with universities and academia organisations such as UNICA, as well as relevant departments of the European Commission. Webinar scheduled for January 2021.</p>
<p><b>The impacts of food processing and fermentation on SDGs.</b></p>	<p>Food processing has been considered both as an important factor in contributing to sustainable food systems (e.g. by extending the ‘shelf life’ of products), and as a cause of health impacts. The proposed debate event will discuss the potential health, environmental, economic and food security impacts of various forms of food processing and fermentation.</p>
<p><b>The impact of food and biomass systems on the development of pandemics.</b></p>	<p>Practices such as ‘wet markets’, deforestation, irrigation dams, and intensive animal husbandry can result in an increase of such so called zoonotic diseases. As the Executive Secretary of the Convention on Biological Diversity stated at the occasion of World Health Day: “The lessons learned from COVID 19 and other epidemics tell us that we need to fundamentally transform our collective relationship with the natural world to prevent, insofar as possible, future pandemic outbreaks”. The proposed debate event will discuss this multifaceted challenge.</p>
<p><b>EU Protein deficiency</b></p>	<p>The EU has had a protein deficiency for decades, for which it needs to import large amounts of proteins (e.g. soy) from outside the EU. Over the years there have been attempts to find alternative protein sources (e.g. growing lupines, process technology using micro-organisms). The proposed debate will discuss the various proposed alternative from various perspectives, such as self-sufficiency, agronomic, environmental and political impacts.</p>
<p><b>Effect of changes in agricultural practices on nutritional profiles.</b></p>	<p>Changes in agricultural practices and alterations to our crops from the early 20<sup>th</sup> century onwards have also profoundly changed the nutritional profiles of our food (as analyses of herbarium and archaeological specimens in one of the FOST projects indicates) – this longer term trend should be included in the debate.</p>

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<p><b>Intellectual property in food and farm law – Transparency v. innovation</b></p>	<p>IPRs range from the seed planted to the food consumed. “Patents on life” is a highly controversial topic as well as plant breeders’ rights, the handling of trade secrets and geographical indications. Data protection in food law has a whole different meaning than otherwise perceived. Unresolved is the question as to who owns and is able to exploit “big data” gathered on farmland and increasingly digitalised agricultural operations. Related to food and farm, IPRs become subject to passionate, but often ill-informed debate. Europe is challenged to find a suitable approach balancing inventors’ interests and citizens expectations.</p>
<p><b>Farmland in the TFEU – National wealth or market commodity?</b></p>	<p>The real estate corollary to IPRs in the agro-food chain is ownership of farmland, investment in land and restrictions imposed by the regulator. Arable land and healthy soil is a much sought after commodity and increasingly subject to concentration and speculation. The ECJ/CJEU was on several occasions requested to reconcile the Treaty with national law. UNIDROIT is looking into the law of the farmland.</p>
<p><b>Food private law</b></p>	<p>Unfair trading practices and contractual relationship in the food chain have recently become subject to EU legislation but food private law ranges much further and includes private standards, certification and audits establishing de facto global rules. So far, legal doctrine has not sufficiently looked into the complex legal structures thereby created and how it impacts back on food public law.</p>
<p><b>Sustainable food 2023</b></p>	<p>Features for the legislative framework for sustainable food systems the European Commission wants to present 2023</p>
<p><b>Peer review</b></p>	<p>Peer review: What is it and what is it not?</p>
<p><b>Data driven and Evidence based policy making and implementation.</b></p>	<p>Evidence based policy making: what does it mean in practice. The ‘weight of evidence’ approach.</p>
<p><b>Food safety</b></p>	<p>To ensure quality, food is subject to continuous monitoring in order to verify the quality of the food, to identify and control outbreak or ensure the freedom of choice of the consumer (ex GMO). Transversal/multidisciplinary approaches crossing all sectors (one health) is necessary for an efficient approaches as well the use of new tools like high throughput sequencing and bioinformatics .</p>
<p><b>Food related Chronic diseases</b></p>	<p>Chronic diseases (cancer, diabetes, obesity, allergy, asthma...) are increasingly prevalent in developing nations. Searching the factors influencing these diseases in link with alimentation, pathogen infection or environmental exposure , genetics and epigenetic as well biomarkers of exposures is crucial. Transversal/multidisciplinary approaches crossing all sectors (one health) is necessary for an efficient approaches as well the use of new tools like high throughput sequencing and bioinformatics is necessary for an efficient approaches.</p>