How can food processing achieve food and nutrition security?

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Four main actors

A takeover of the chain by farmers?

?

10% GHGE

24% GHGE

Production
Animal and vegetal

Food processing
Animal and vegetal

Food retail

Consumption

?

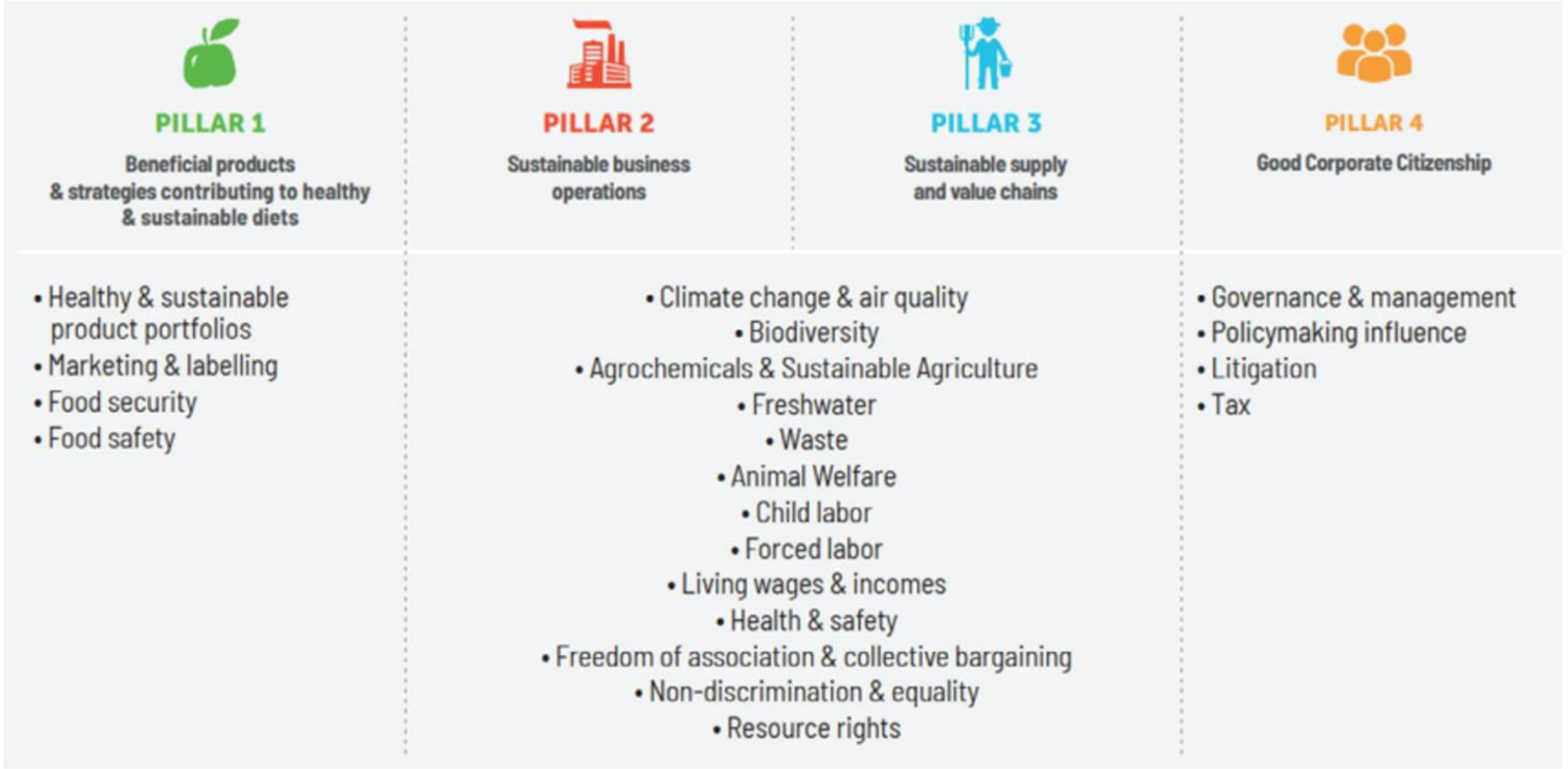
An under-estimated actor/driver?
Black box?

?

?

Fardet et al; (2024). How can food processing achieve food and nutrition security? Sustainable Development. Ahead of print
Crippa et al. (2021). Food systems are responsible for a third of global anthropogenic GHG emissions. Nature Food 2(3), 198-209.
Axelos et al. (2020). Nexus Santé: entre Agriculture – Alimentation – Environnement. Réflexion Prospective Pluridisciplinaire

The Four pillars of agro-food industry sustainability: a very holistic approach



The four pillars of agro-food industry sustainability (From Barilla Foundation (Barilla Foundation et al., 2020)).

Barilla Center for Food and Nutrition (2018). Fixing food 2018 : towards a more sustainable food system.

The 6 dimensions of food and nutrition security (FAO)

1. **Availability**:
"Having a quantity and quality of food sufficient to satisfy the dietary needs of individuals, free from adverse substances and acceptable within a given culture, supplied through domestic production or imports."

2. **Access (economic, social, and physical)**:
"Having personal or household financial means to acquire food for an adequate diet at a level to ensure that satisfaction of other basic needs is not threatened or compromised; and that adequate food is accessible to everyone, including vulnerable individuals and groups."

3. **Utilization**:
"Having an adequate diet, clean water, sanitation, and health care to reach a state of nutritional well-being where all physiological needs are met."

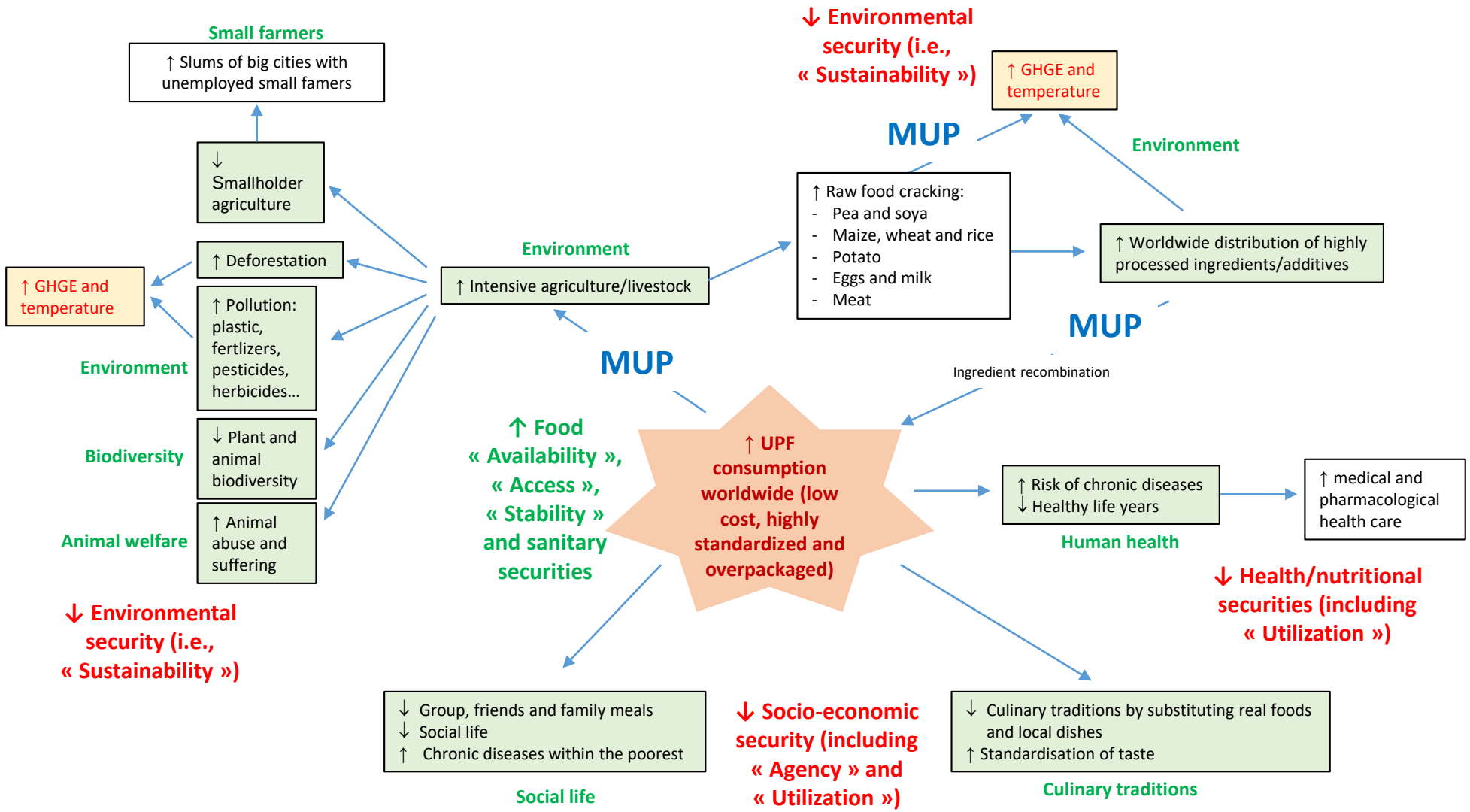
4. **Stability**:
"Having the ability to ensure food security in the event of sudden shocks (e.g., an economic, health, conflict or climatic crisis) or cyclical events (*e.g.*, seasonal food insecurity)."

5. **Agency**:
"Individuals or groups having the capacity to act independently to make choices about what they eat, the foods they produce, how that food is produced, processed and distributed, and to engage in policy processes that shape food systems. The protection of agency requires socio-political systems that uphold governance structures that enable the achievement of FNS for all."
Today, "Agency" has been largely co-opted by large multinationals with a great reliance on ultra-processed foods.

6. **Sustainability**:
"Food system practices that contribute to long-term regeneration of natural, social and economic systems, ensuring the food needs of the present generations are met without compromising the food needs of future generations."
We should also add that food system practices should contribute to the preservation of agrobiodiversity.

HLPE/FAO, 2021. Report on food security and nutrition: building a global narrative towards 2030. HLPE/FAO.

Ultra-processing and 6 dimensions of food and nutrition securities



Fardet et al. (2024). How can food processing achieve food and nutrition security? Sustainable Development 32(4), 4172–4185.

What is a healthy food? “Food matrix governs, nutrients obey”
The food matrix as a core concept of agro-food industry sustainability, not composition

=

Holism (cause): global → **Reductionism (effects): specific**

« Matrix » effect » (qualitative and holistic fraction)

X

« Composition » effect (quantitative and reductionist fraction)

Processing

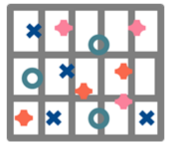
Chronic metabolic diseases
- Chewing & satiety
- Speed of transit time
- Kinetics of hormonal secretion
- Bio-accessibility, bioavailability and metabolic use
- Glycemic index, kinetics of proteic anabolism and lipidic metabolism
- Synergistic action of bioactive compounds

Deficiency diseases
- Nutritional needs (DRI)
- Anti-nutritional factors
- Added simple sugars and salt (« empty » calories)
- Added salt

1) Nutritional recommendations on the "matrix" first → **2) Nutritional recommendations on "composition" second**

Fardet, A., and E. Rock. 2020. Exclusive reductionism, chronic diseases and nutritional confusion: degree of processing as a lever for improving public health. Critical Reviews in Food Science and Nutrition.
Fardet, A., and E. Rock. 2018. Reductionist nutrition research has meaning only within the framework of holistic thinking. Advances in Nutrition 9 (6):655–670.

The 3V rule's decision tree to address all food and nutrition securities



1) « Matrix » effect (holistic food fraction) at the level fo the food

2) « Composition » effect (reductionist food fraction) at the level of the diet

Vrai Végétal Varié

Holistic, healthy and sustainable diet

Rule 1

« **Vrai (Real)** »
(85-100% calories)

Rule 1

« **Ultra-processed** »
(0-15% plant and/or animal calories)

Rule 2

« **Végétal (Vegetal)** »

Favor plant-based calories

Rule 3

« **Varié (Varied)** »

(if possible agroecoloy/organic, local and/or seasonal)

Max. 15% animal-based calories

Rule 3

« **Varié (Varied)** »

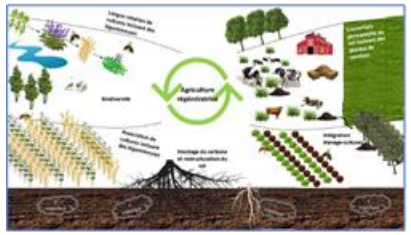
(if possible agroecology/organic, local and/or seasonal)

- **Favor solid foods over liquids**
- **Promote whole grains over refined starchy foods**
- **Limit additions of salt, sugar and/or fat**

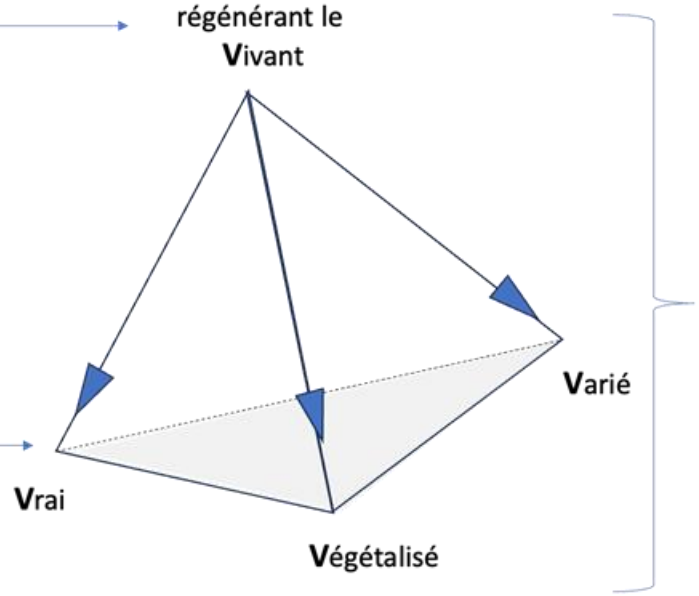
Fardet, A. (2024). Ultra-processing should be understood as a holistic issue, from food matrix, to dietary patterns, food scoring and food systems. Journal of Food Science.

The 4V rule (Vrai/Veritable,Végétal/Vegetal,Varié/Varied, Vivant/Vital) to include production quality

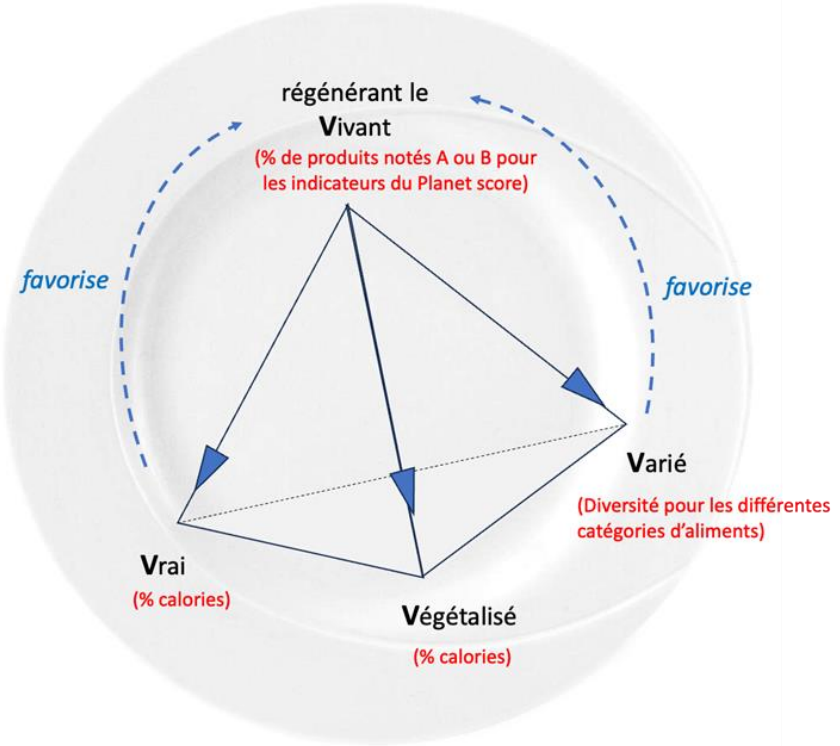
Modes de production agricoles sous jacents aux aliments



Composition de l'assiette : type et structure des aliments



Effets de la composition de l'assiette sur la santé et l'environnement



*M. Duru, A. Fardet (**, 2024). La règle des 4V : Vraie, Végétalisée, Variée et régénérant le Vivant. Regards, **, **-**.*

Which solutions? Conclusions and perspectives

"It is concluded that food processing should become more involved in circular food systems and bio-economy, and that we need to relocate food production, processing, and consumption to be more aligned with regional food production specificities. ***For this, minimal processing to preserve food matrices should be preferred****. Therefore, the strong current tendency to develop reductionist and silo innovative solutions to improve the sustainability of food systems should be questioned (i.e., greenwashing)."*

- Tasty, healthy, safe, sustainable foods: the quadruple industrial constraint
  - Industrial foods/ingredients with the most preserved matrix
  - Developing non ultra-processed plant-based foods
  - UPF is not the solution to food and nutrition securities: silo and reductionist innovations and greenwashing…
- Developing more circularity of food processing
  - Developing more small and medium agri-food industries as model
  - Relocating food processing
- Studying more contribution of UPF to global health
- Holistic research in reality: The role of living labs and Territorial Food Projects to address complexity
- …

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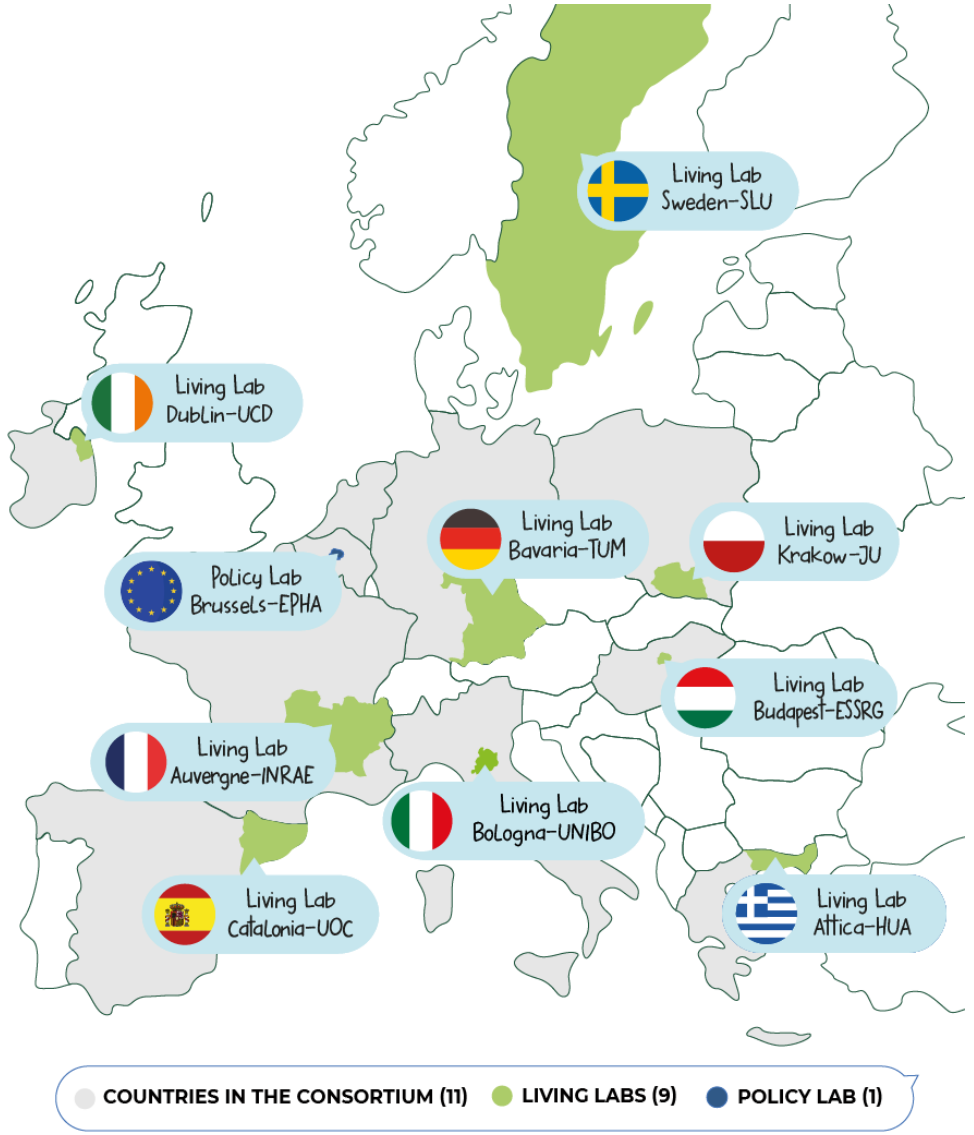
The holistic living lab approach to develop sustainable food processing



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Thanks for your attention!
Questions are welcome!