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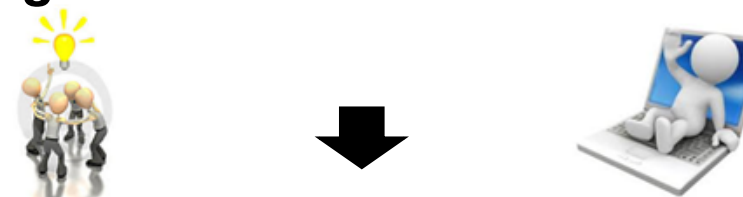
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Key aspects for the transformation of former foodstuffs into animal feed or high value products

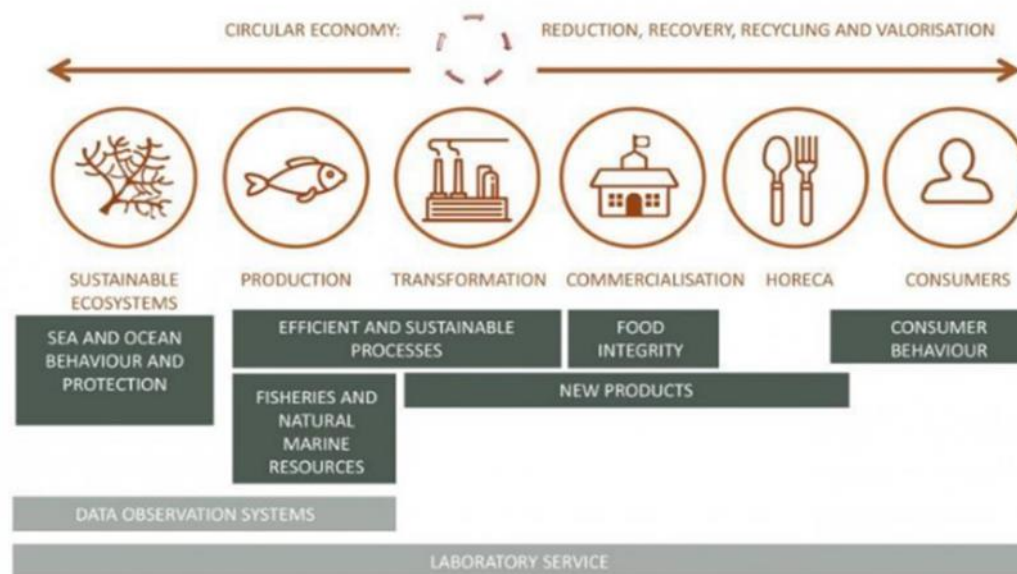
David San Martin Errea

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AZTI transforms science into solutions that respond to the great challenges of the sea and food value chain.

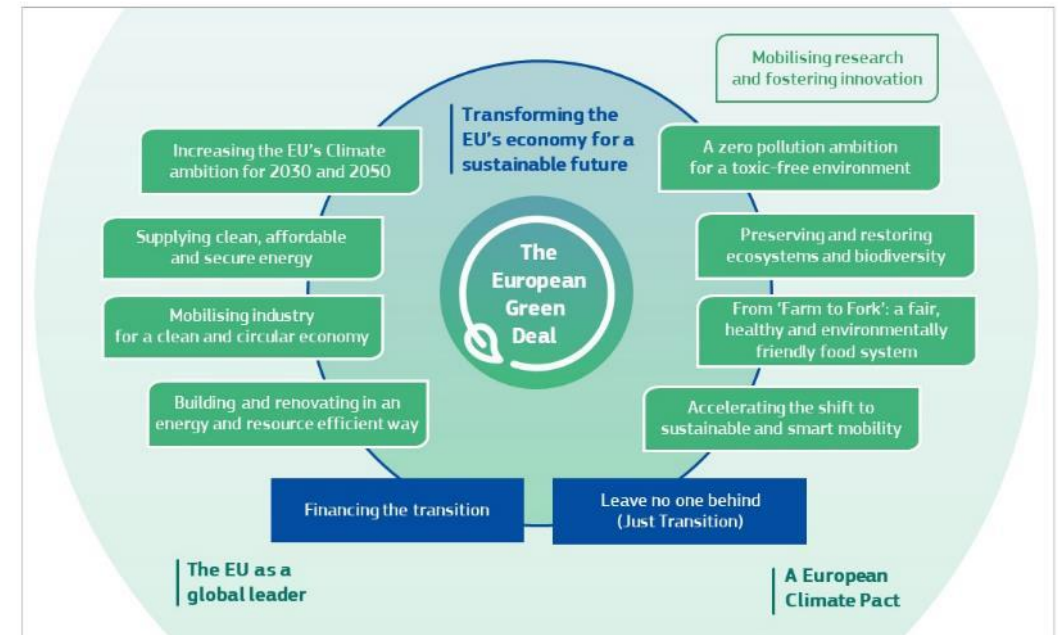


Sustainable products, services and business initiatives aimed at activating the industrial fabric while recovering and preserving natural resources.



Agri-food is one of the priority economic sectors

High impact in SDGs: Farm to Fork; European Green Deal



Sustainability in Agri-food industries



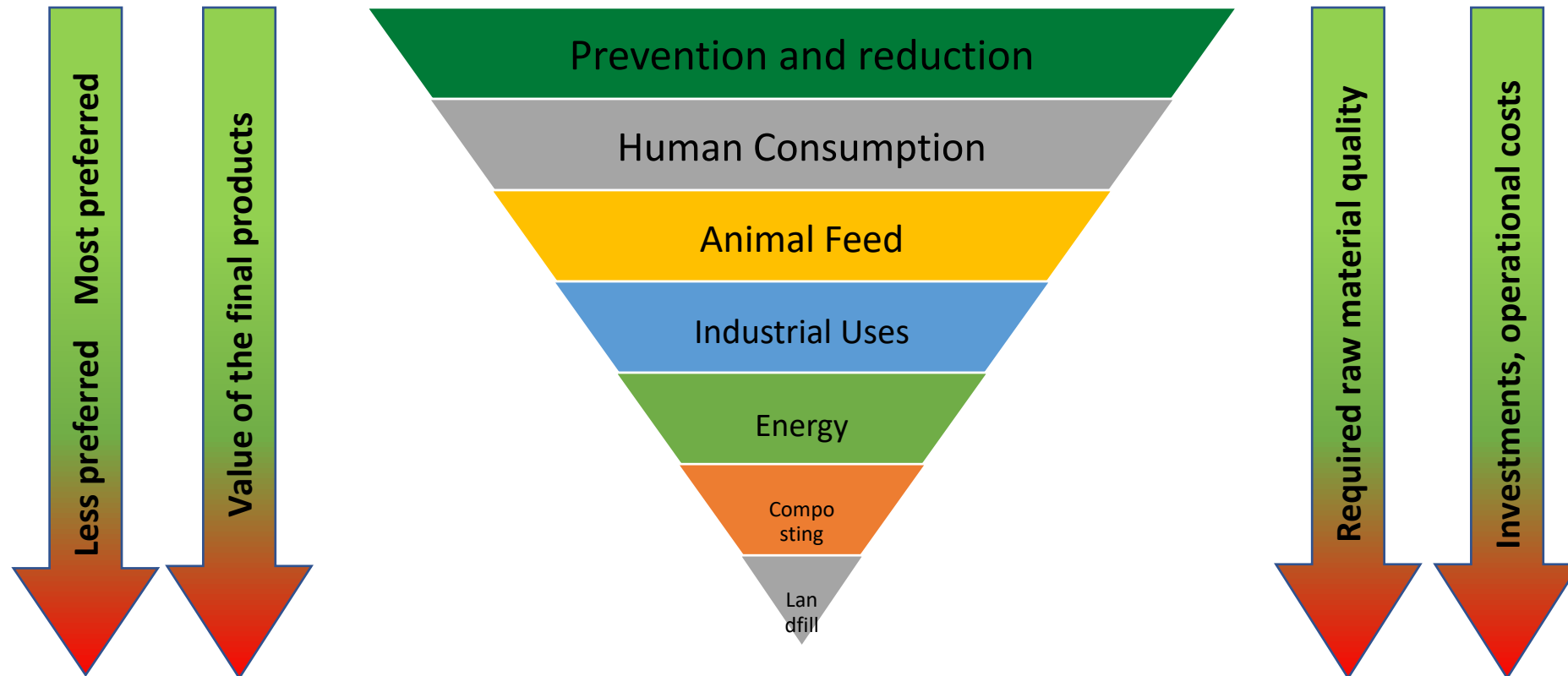
Source: Medium.com

“A Sustainable food production is a method of production which uses processes and systems that are: 1) non-polluting; 2) conserve non-renewable energy and natural resources; 3) are economically efficient; 4) are safe for workers, communities and consumers; and 5) do not compromise the needs of future generations”. Source: World Commission on Environment and Development

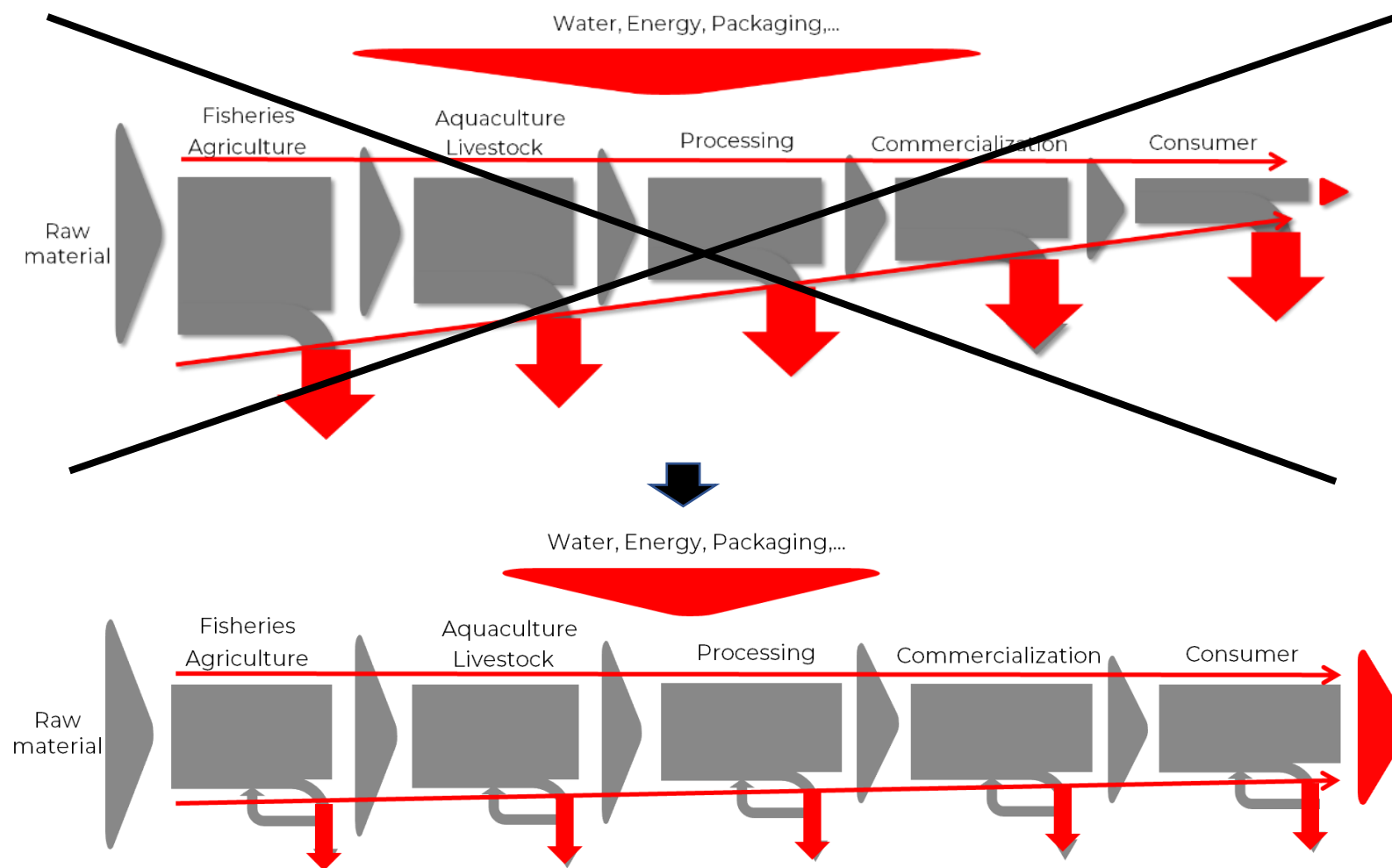


Turning unavoidable food waste into animal feed increases sustainability through efficient use of natural resources

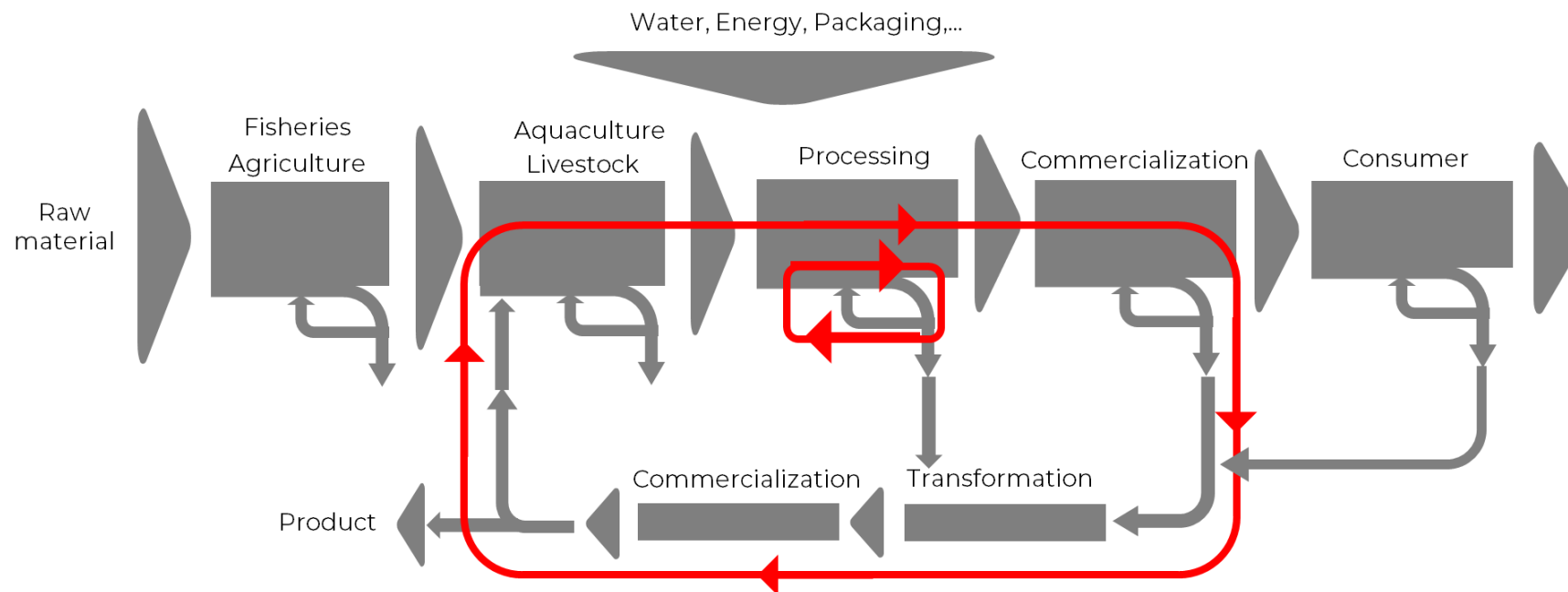
Hierarchy of priorities for FLW valorisation alternative



Prevention & Reduction FLW → 1st Strategy



Valorisation & Circular economy FLW → 2nd Strategy



Big Problem:

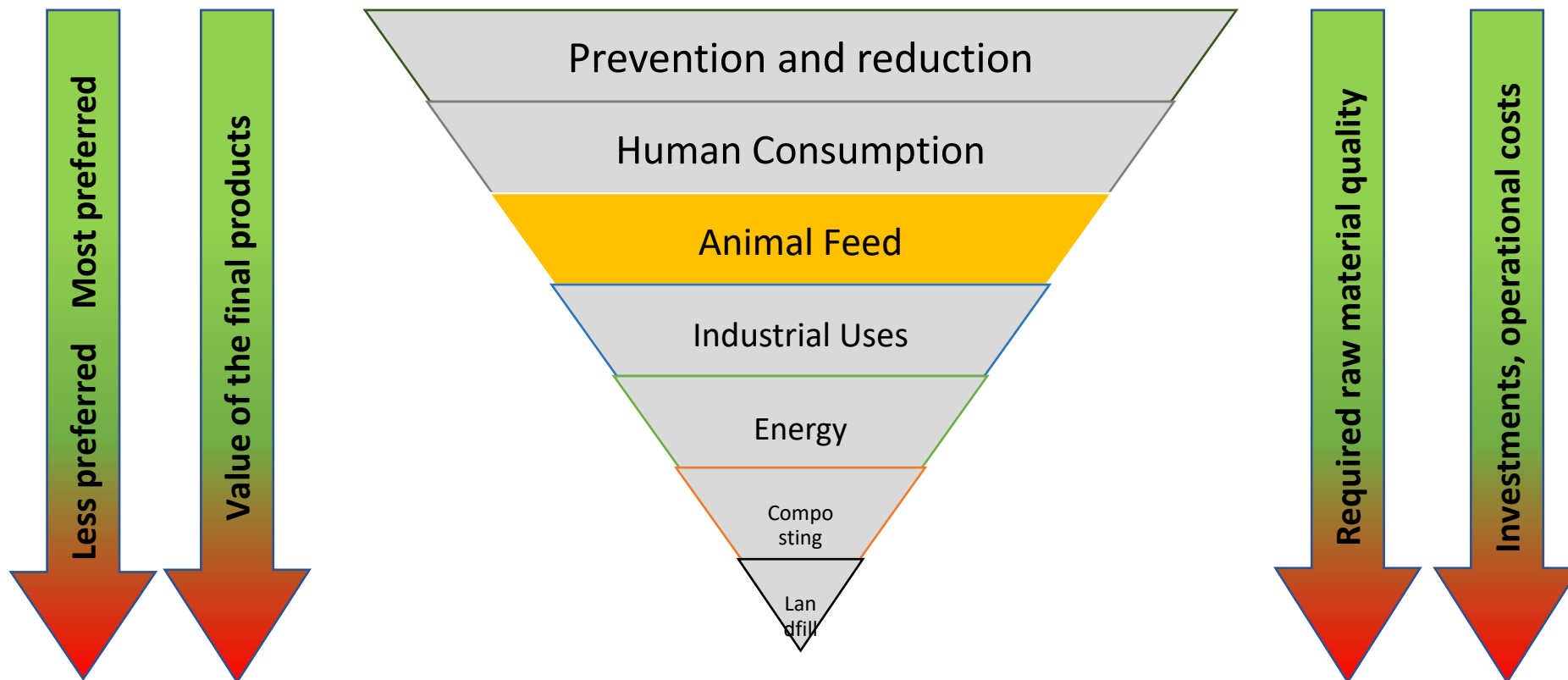
- ↑ management costs
- ↑ use of natural resources
- ↑ environmental impact



New business opportunity:

- Food grade raw materials
- High nutritional potential
- Organic origin
- Absence of undesirable substances

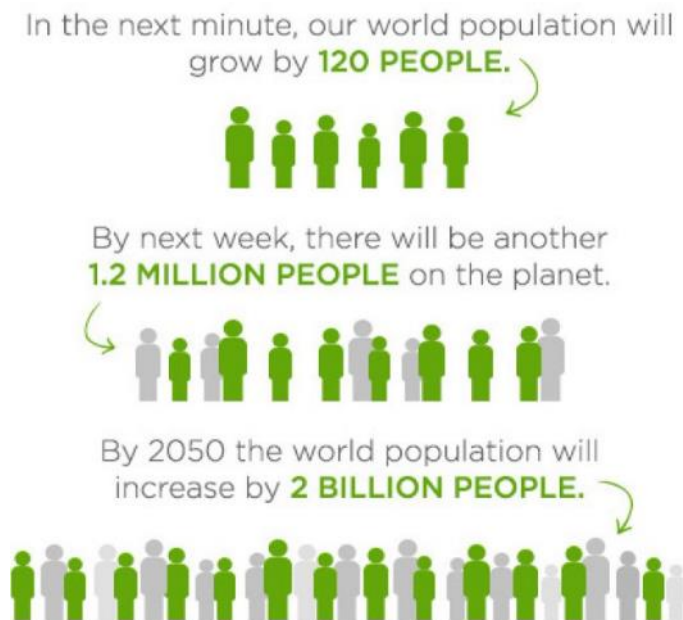
Hierarchy of priorities for FLW valorisation alternative



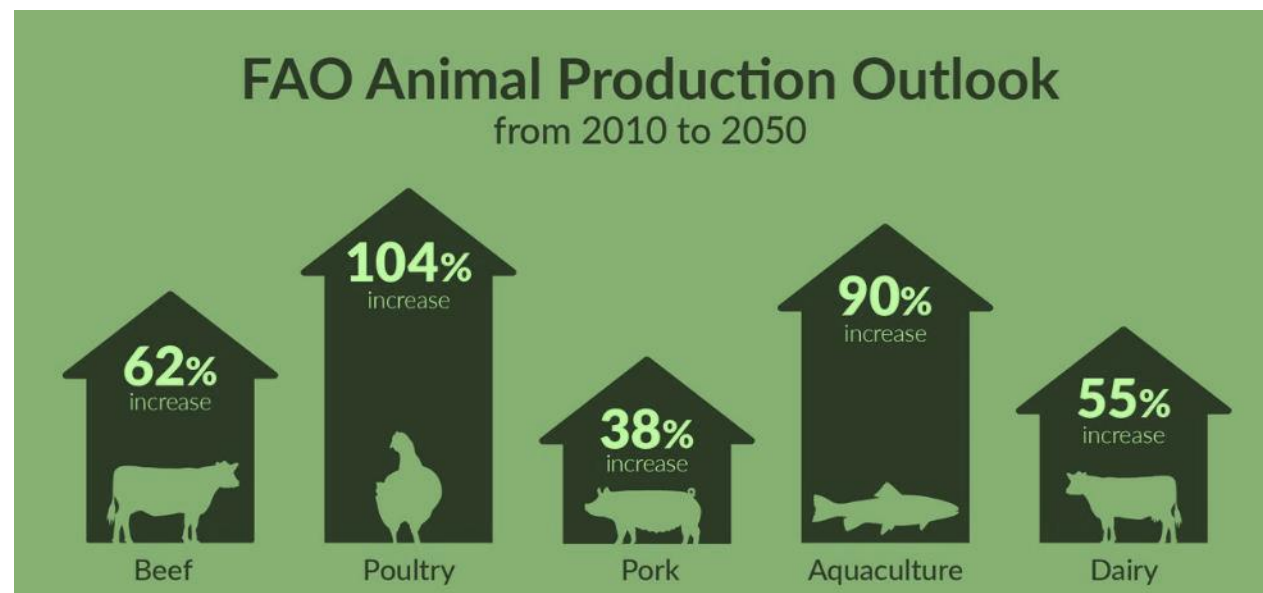
Evolution of global demand of animal protein

Estimates suggest that global meat demand will double during the period 2000-2050.

(Source: Pelletier and Tyedmers 2010; Alexandratos and Bruinsma 2012; Pradhan et al., 2013; Herrero et al., 2015).

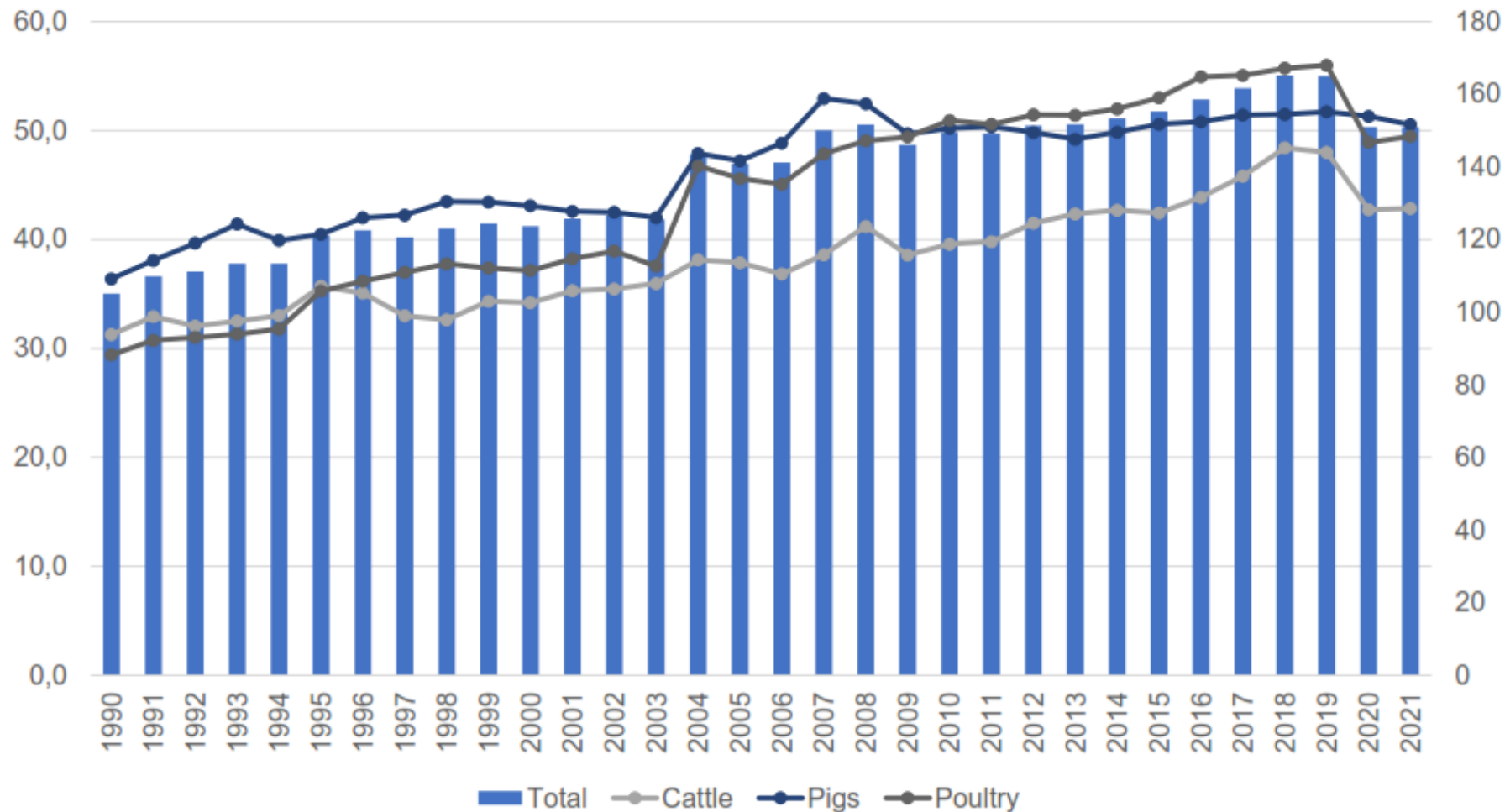


Source: FAO



Source: International Feed Industry Federation. FAO

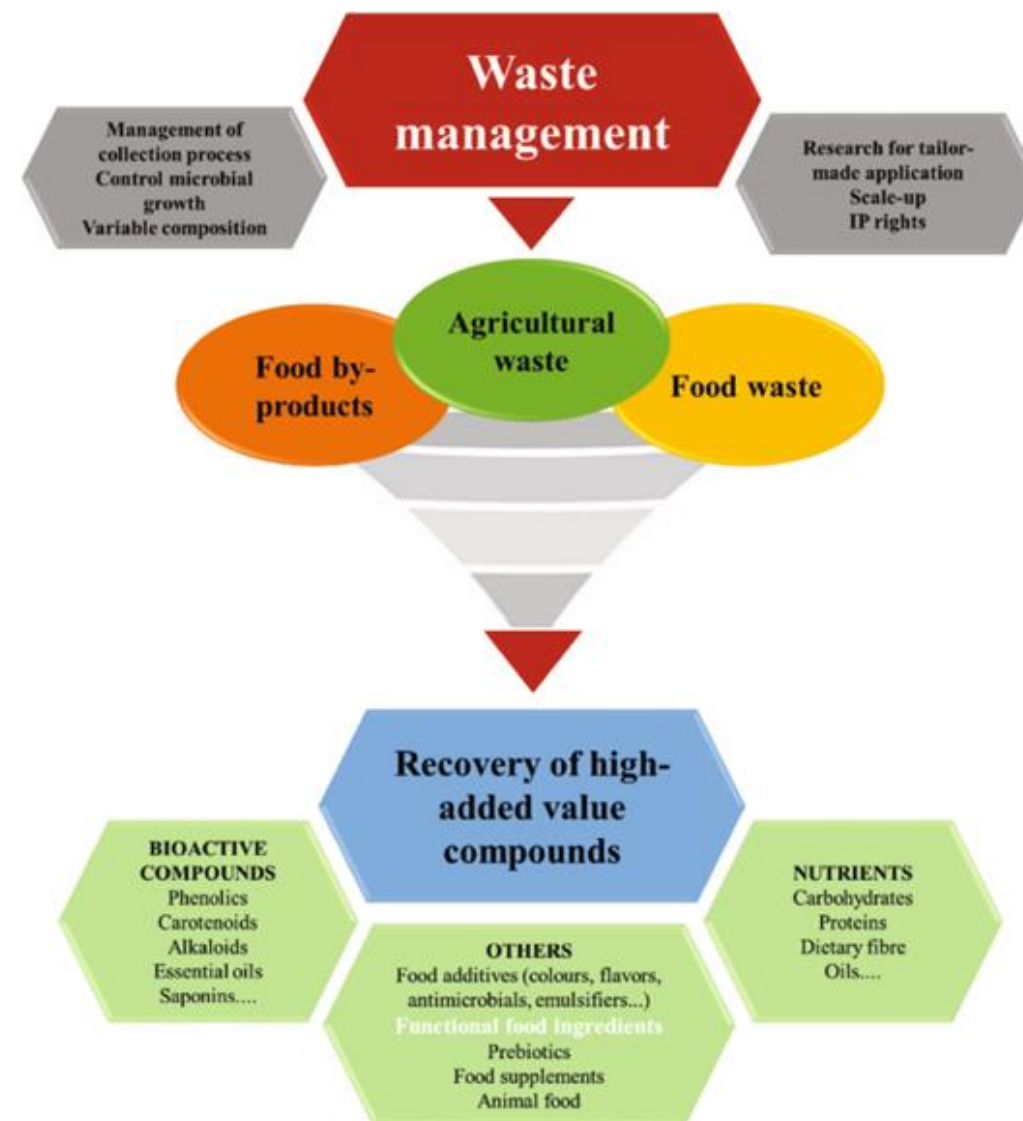
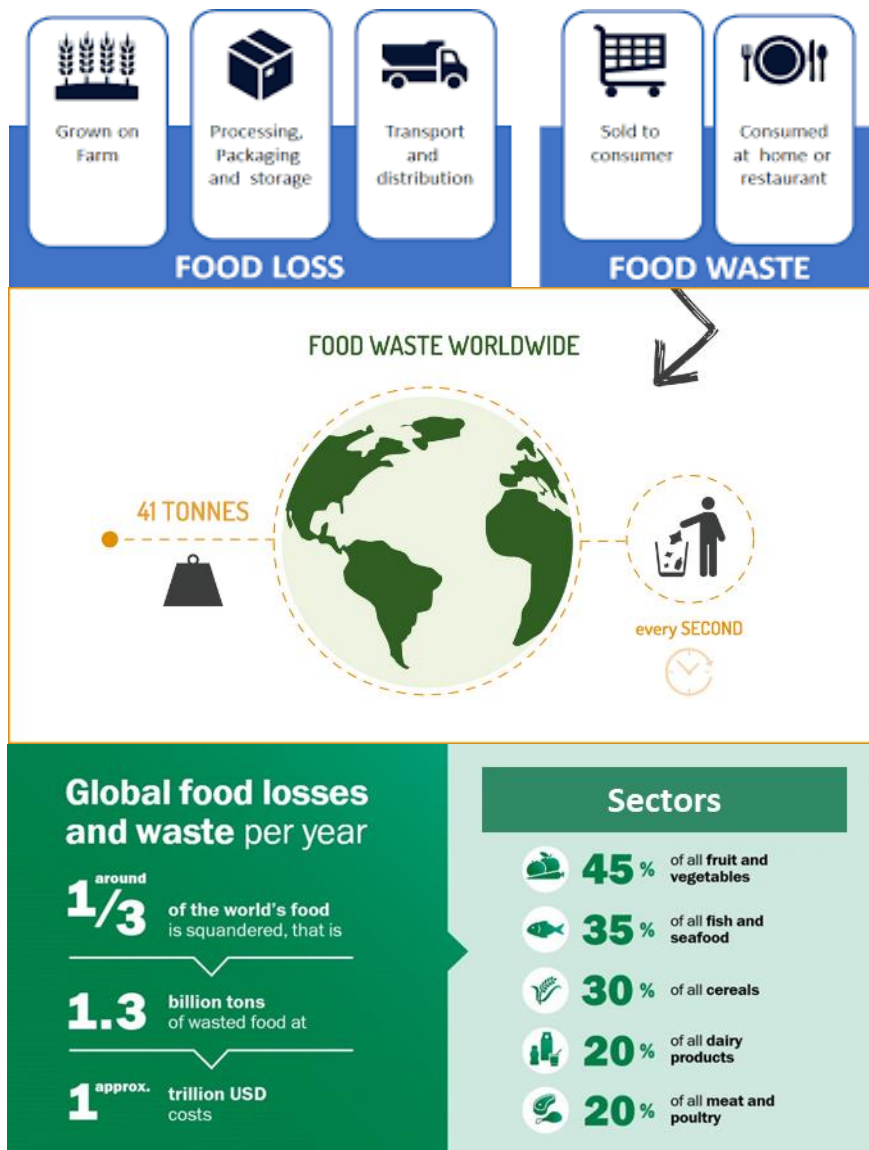
Evolution of global compound feed production



*EU-15 from 1994, EU-25 from 2004, EU-27 from 2007, EU-28 from 2013, EU-27 from 2020; excl. Luxembourg, Greece and Malta

Source: FEFAC

Food Loss and Waste as an opportunity



Work flow to transform former foodstuffs into animal feed

By-products

Logistic

Process Technologies

Bioproducts

Value Assessment



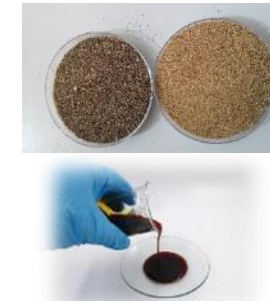
- Vegetable
- Fish
- Meat
- Dairy



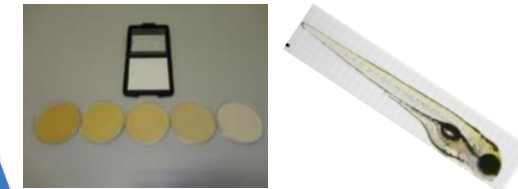
- Protocol for hygienic handling
- Logistics routes for centralizing
- Traceability



- Extraction S/L
- Filtration
- Fermentation
- Hydrolysis (enzymatic; chemical)
- Stabilisation (dewatering / thermal drying)



- Protein concentrates
- Protein hydrolysates
- Bioactive peptides
- Mineral supplements
- Fibres



Nutritional value:

- Protein; Fibre; Energy; ...
- Digestibility

Technological properties:

- Colour
- Flavour
- Texture
- Water binding

Bioactivities:

- Antioxidant
- Antimicrobial
- Antihypertensive
- Anti-inflammatory
- Osteoprotective

FEED APPLICATIONS



PETFOOD

LIVESTOCK

AQUACULTURE



CIRCULAR ECONOMY

Key aspects to consider to implement a Valorisation alternative

Geographical viability

- Geographic dispersion
- Distance to main roads
- Logistic routes
- Etc.

Legal requirements

- Regulatory framework
- Undesirable substances
- End of waste conditions
- Traceability
- Etc.

Technical viability

- Type and Volume
- Composition
- Seasonality
- Logistics
- Nutritional value
- Process complexity
- Availability of the technology
- Etc.

Environmental viability

- Carbon footprint
- Water footprint
- Etc.

Economic viability

- Investment cost
- Sales incomes
- Processing costs
- Logistics costs
- Etc.

Market viability

- Market demand
- Competition
- End users interested
- Investors
- Etc.



High risk of
underestimating
some of these factors

MCDA methods



- ✓ Legal
- ✓ Technical and sanitary feasible
- ✓ Economic profitable
- ✓ Environmental sustainable

AGRIFOOD – CIRCULAR - BIOECONOMY

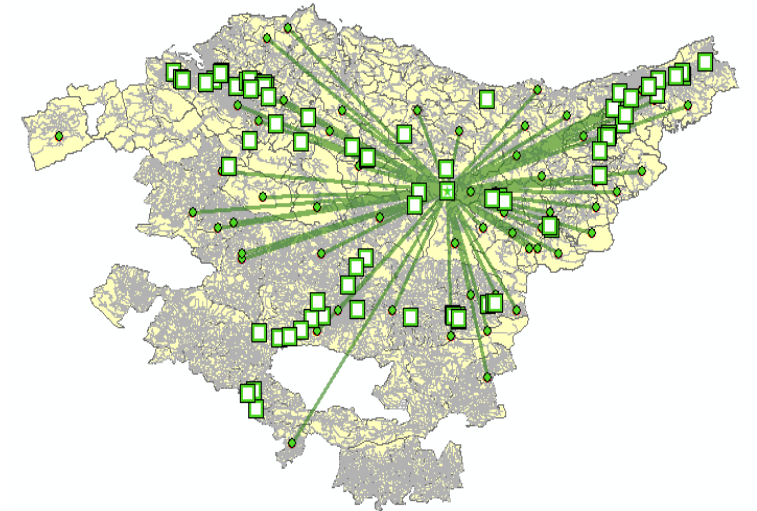
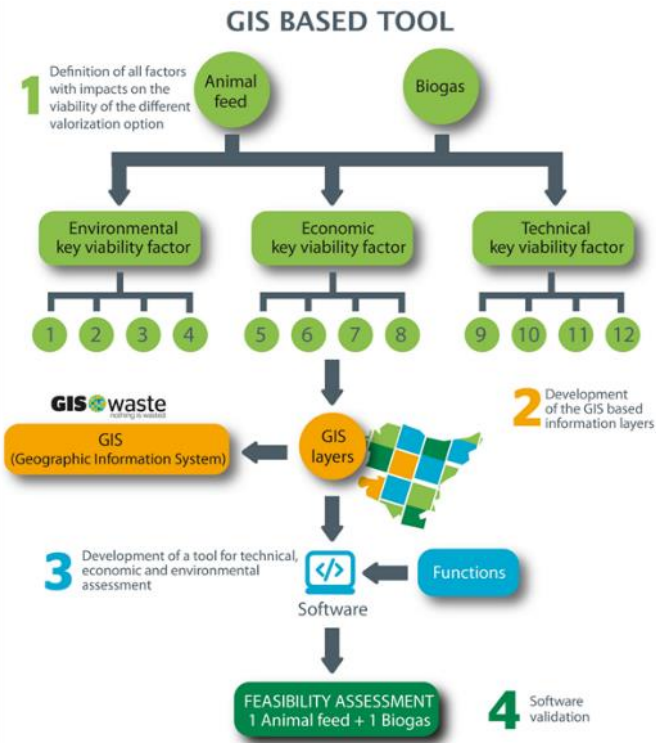
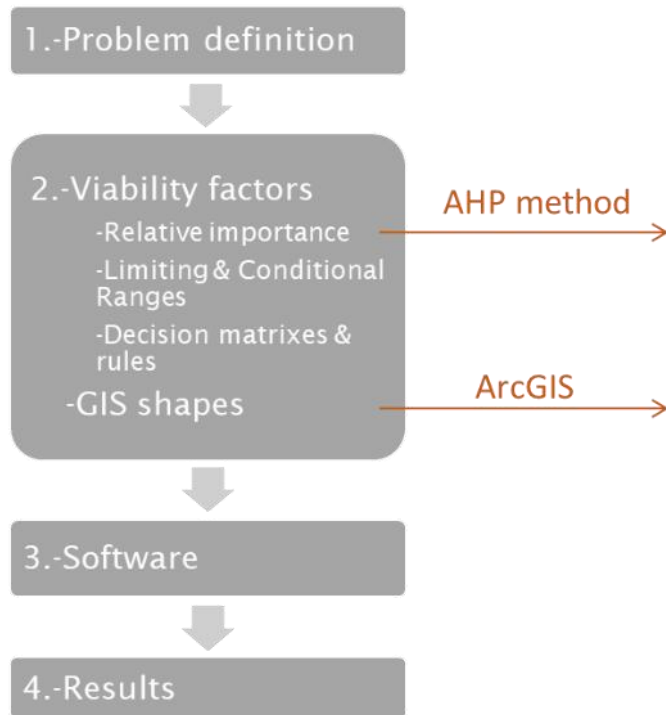
- Examples of Circular economy models for the valorisation of side-streams from food industry value chain -



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Objective: Develop a GIS-based tool which **simulates the technical, economic, and environmental viability of the recovery alternatives for the agri-food by-products** (chiefly vegetables, meat, and dairy products) in the Basque Autonomous Community.





- Prevention of vegetable waste generation and reuse for animal feed in the Autonomous Community of the Basque Country -



Objective: Design, test and validate an Action Plan to **transform vegetable by-product** originated in the Industry and food distribution **in feed ingredient animals.**

Production

Logistics

Processing

End users





LIFE11 ENV/ES/000639

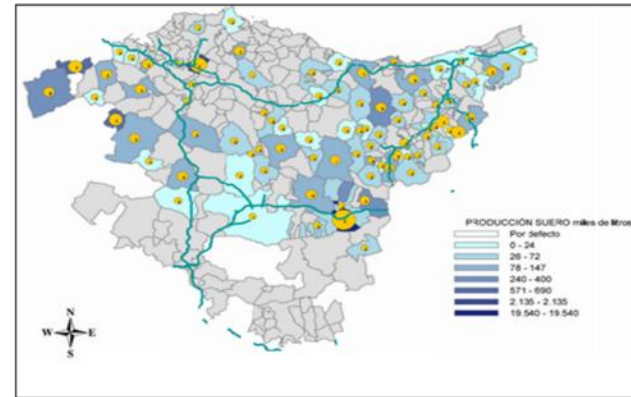
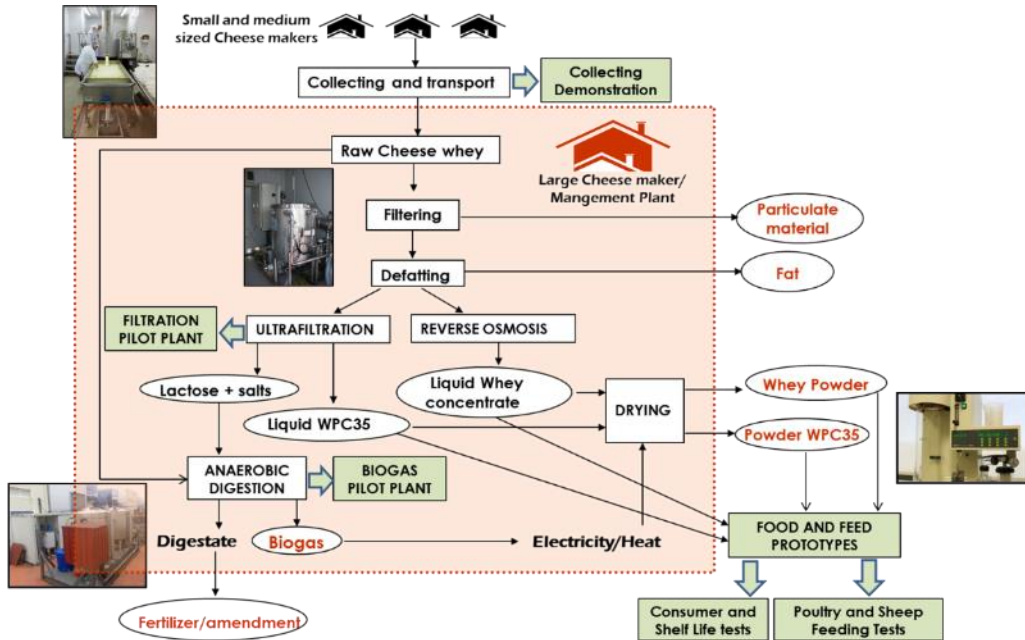


VALORISATION ALTERNATIVES FOR THE CHEESE WHEY GENERATED IN THE DAIRY INDUSTRY



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Objective: Design and validate an Action Plan that enables the management and comprehensive use of the whey generated by cheese industry.



Objective: To define and demonstrate the feasibility of an innovative and sustainable Technological solution to **valorise brewers' by-products as secondary materials for new high value approaches.**



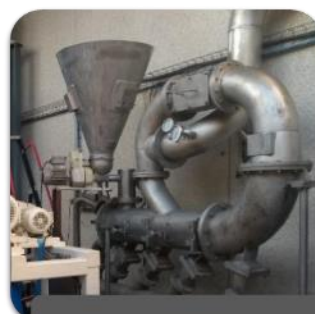
Hydrolysis

Enzymatic hydrolysis
High-value molecules
Digestibility



Dewatering

Decanter & Centrifuge
More efficient and less energy demanding



Drying

Flash drying
High-efficient but more energy demanding



FOOD AND NUTRACEUTICALS

High-quality protein ingredients, rich in functional biomolecules and very competitive in a growing market.



AQUACULTURE

High nutritional value ingredients able to meet the high demand for new raw materials.





LIFE19 ENV/ES/000186

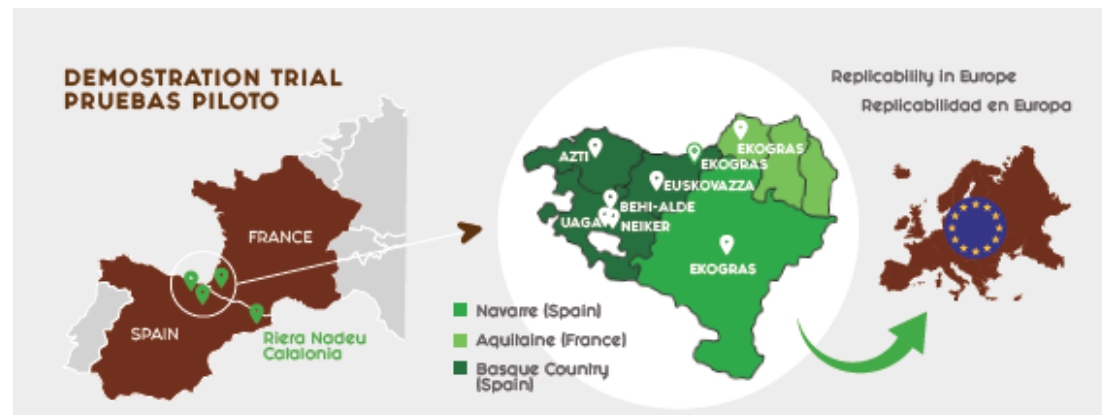
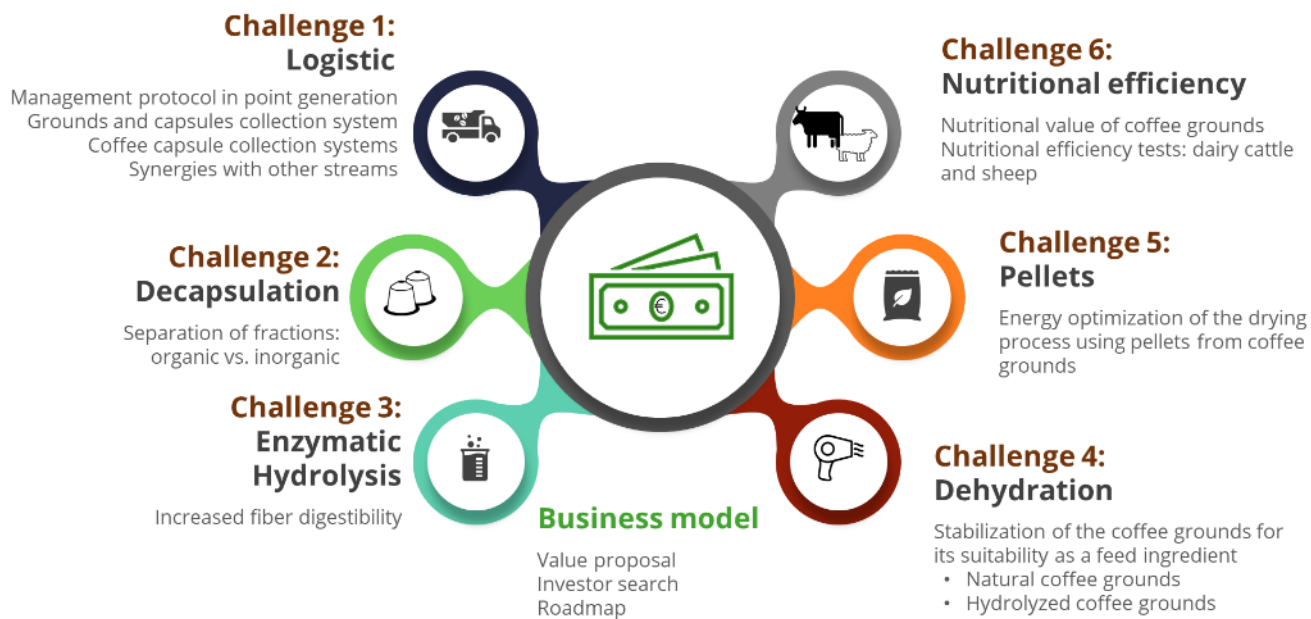


- New strategies for the coffee by-products recovery as a new raw material for animal feed -



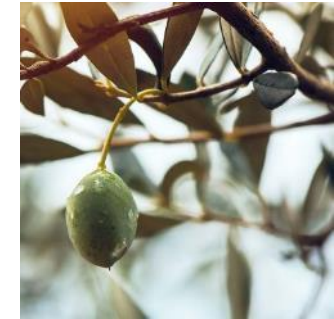
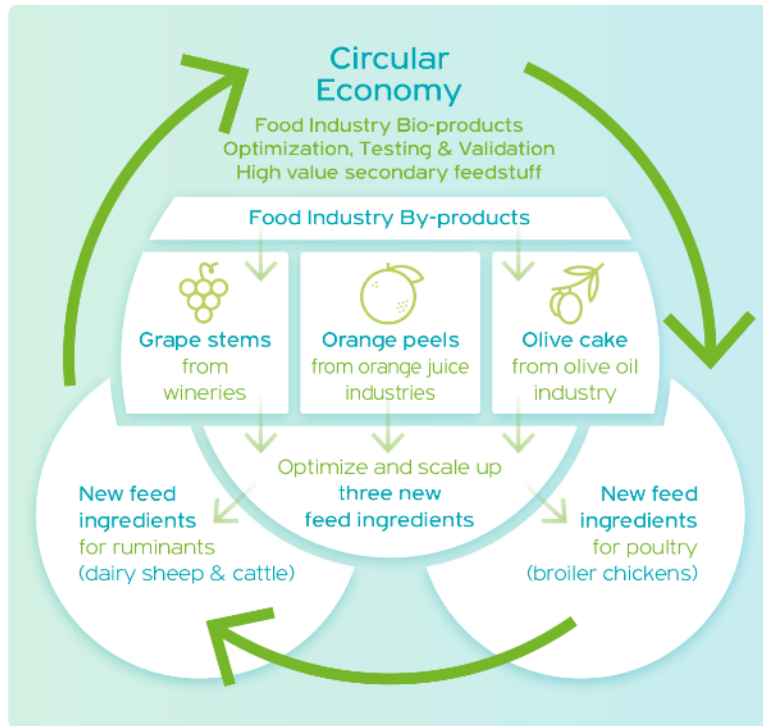
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Objective: Develop, demonstrate and implement at real scale an innovative and sustainable solution for the **recovery of coffee by-products and recovery for their use as an ingredient in animal feed.**



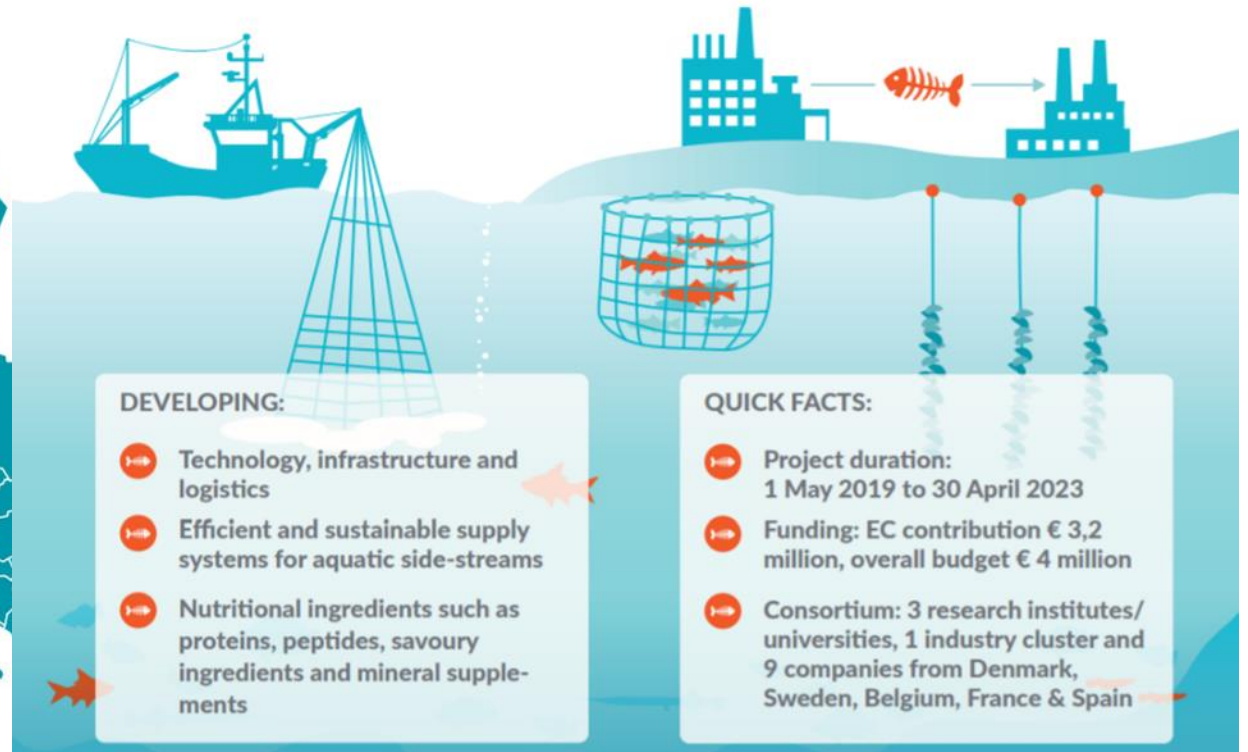
- Use of food industry by-products for the production of feed ingredients in circular-economy schemes -

Objective: Set up a circular economy approach in the livestock production by **valorising the by-products of the food industry to produce feed ingredients**

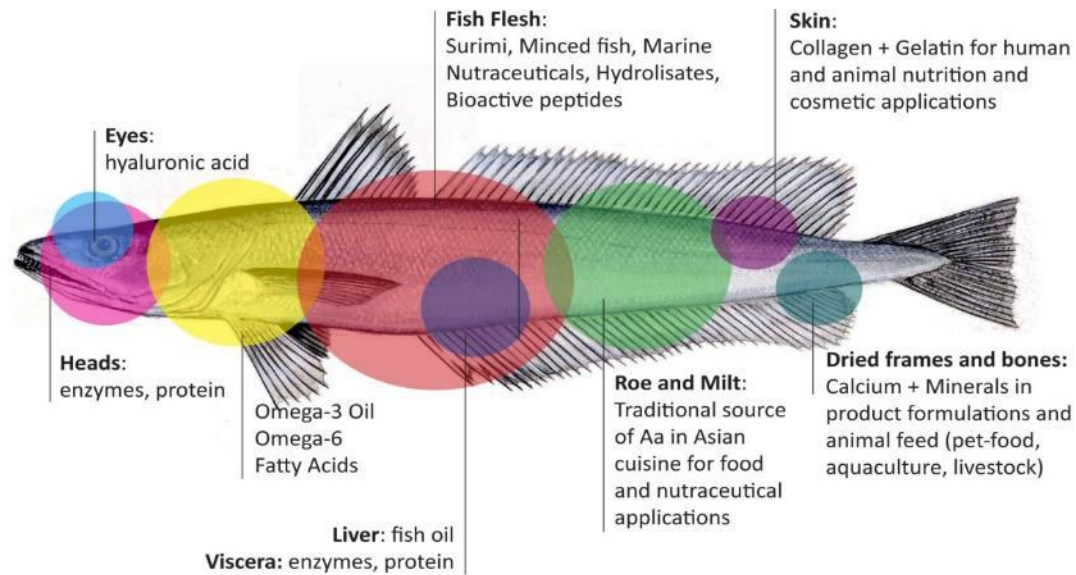


- Optimal utilization of seafood side-streams through the design of new holistic process lines -

Objective: Ensure that side-streams from aquaculture, fisheries and aquatic processing industries can be exploited for **production of new products and ingredients**. By developing storage solutions, sorting technologies and decision tools that will secure an efficient, sustainable supply system for valorisation of these raw materials into marketable products.



Objective: Provide the sector with selection criteria for the best recovery options, as well as the best implementation strategy for said recovery options



All Ingredients: For foods, dietary supplements, animal nutrition, medicine, cosmetic Ingredients, and what cannot be used previously , can go ultimately to bioenergy (biogas)

THANK YOU FOR YOUR ATTENTION

ANY QUESTIONS?

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