



R&D keys to success for nutrient recycling

FER-PLAY End conference Feb 19, 2025

Erik Meers, Ghent University





I. Nutrient Recycling research domains

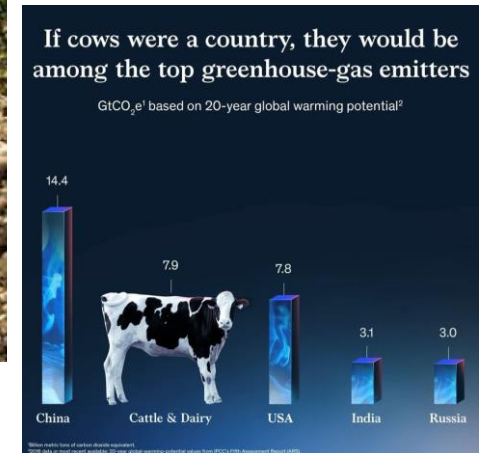
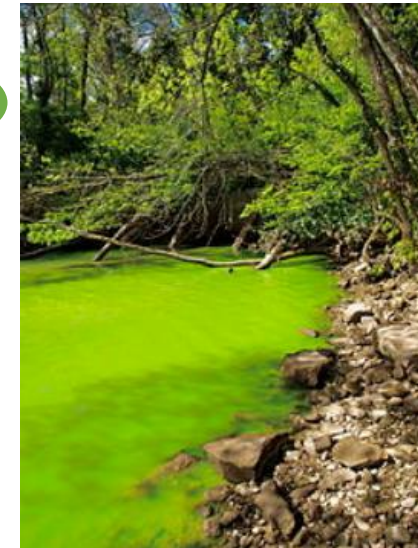
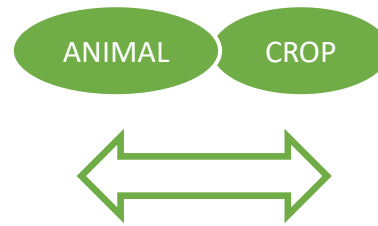
II. Keys to success for implementing R&D to business implementation for nutrient recycling in europe



I. Nutrient Recycling research domains



Plant production and animal husbandry have each independently intensified over the last century



Crucial for EU food supply & self-sufficiency

Environmental challenges & economic pressure

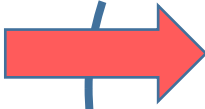


Import of primary nutrients & energy

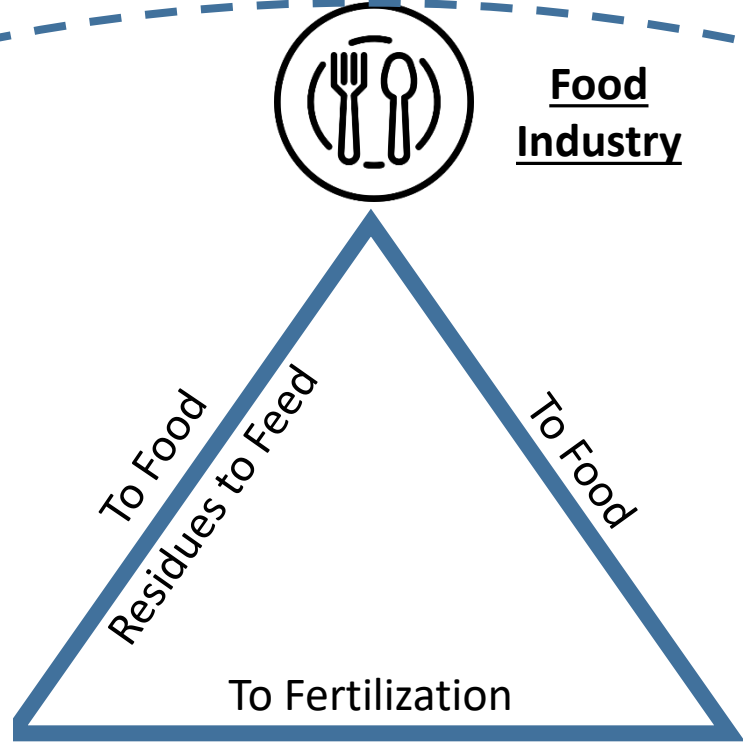
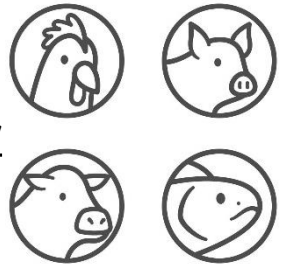
Gaps in the C-N-P cycle



External Input
Energy &
Nutrients



Animal
husbandry



Food
Industry



Plant
production



Nutrient
losses to
environment



High GHG
footprint

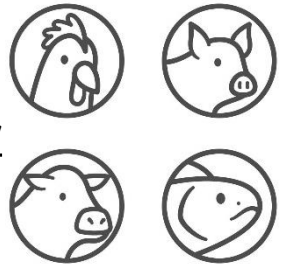




External Input
Energy &
Nutrients



Animal
husbandry



Food
Industry

To Food
Residues to Feed

To Food

To Fertilization

To Feed



Plant
production

*Eutrophication
Biodiversity loss
Marine dead zones*

Nutrient
losses to
environment

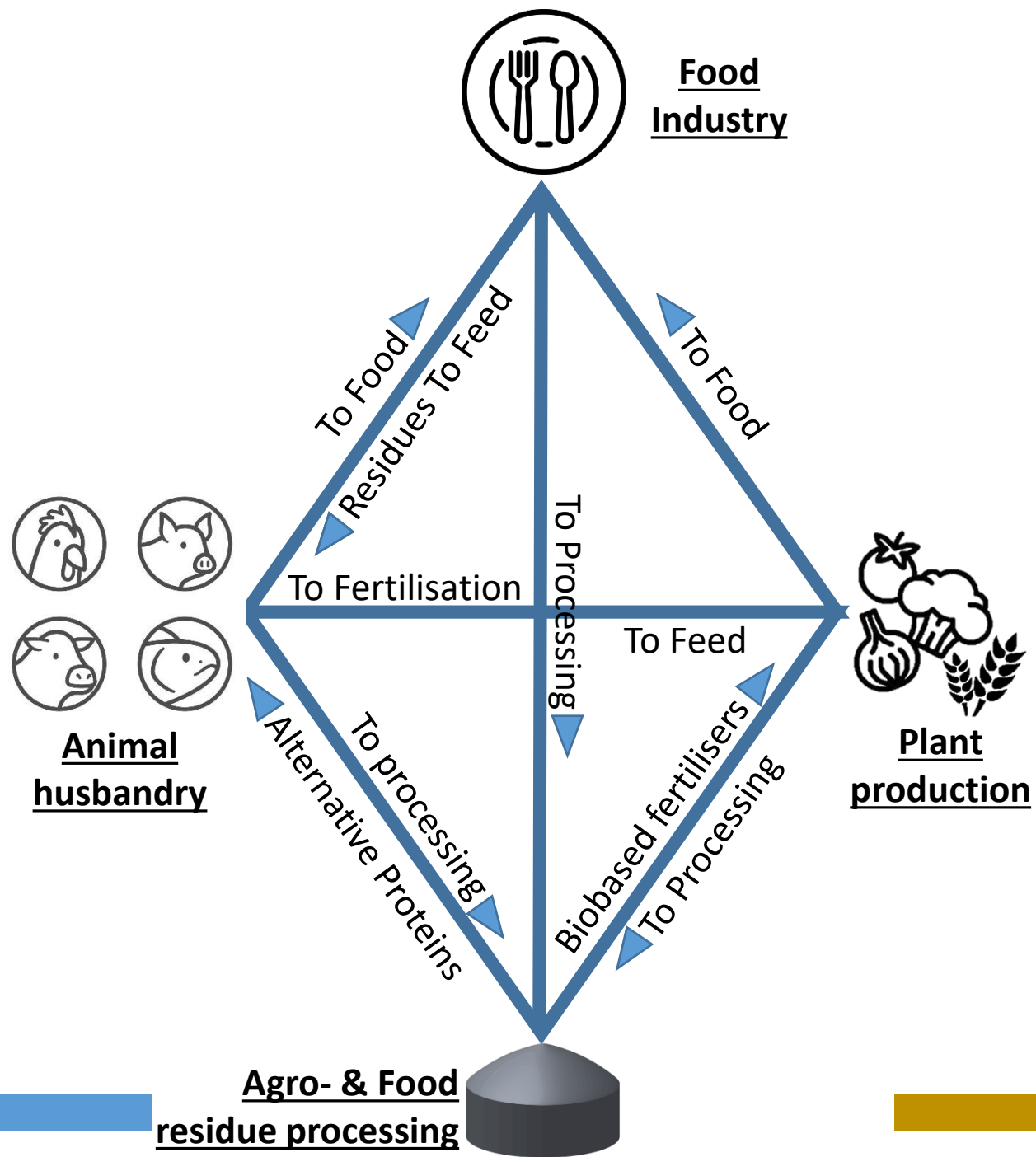


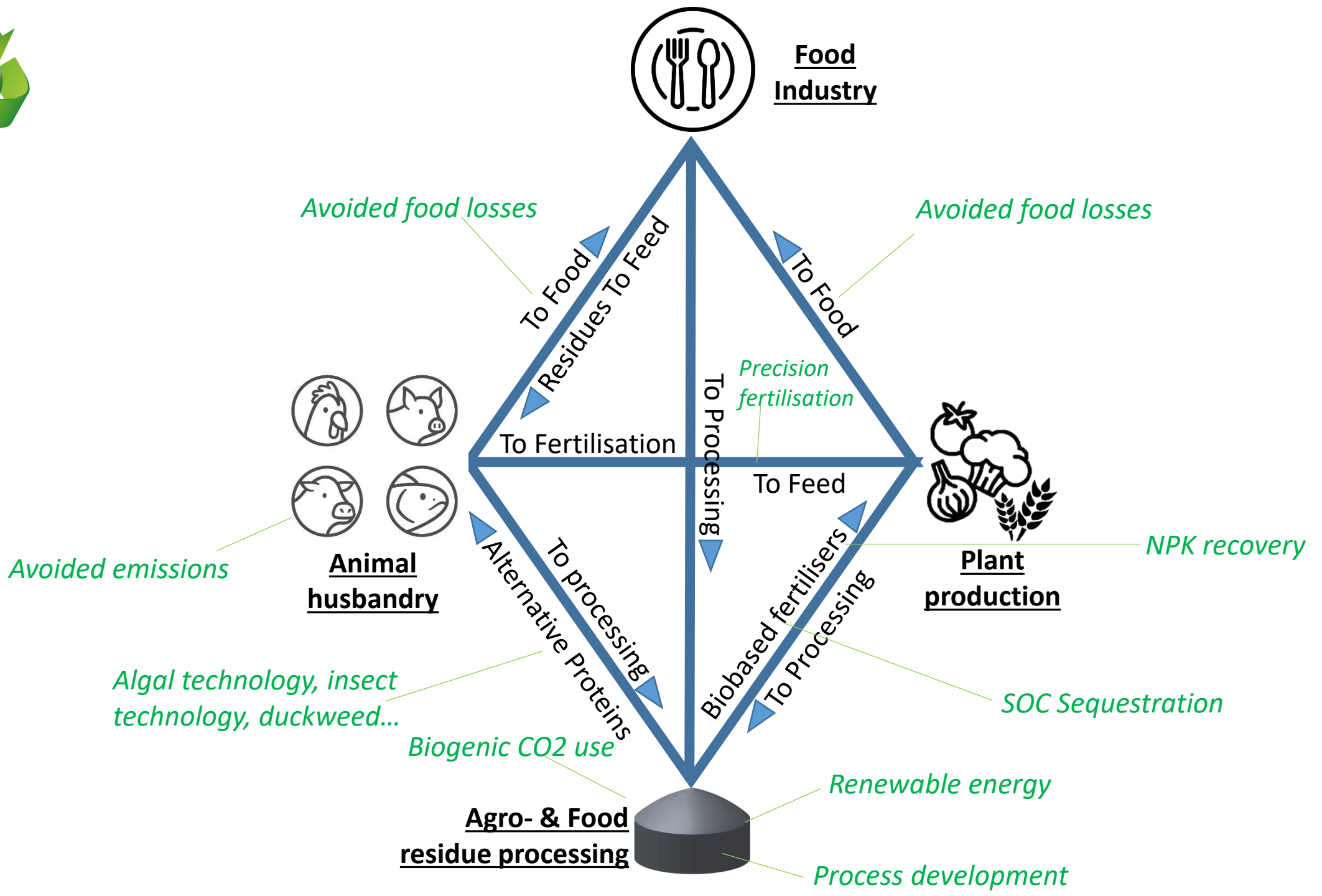
High GHG
footprint

*Agriculture
important
contributor*

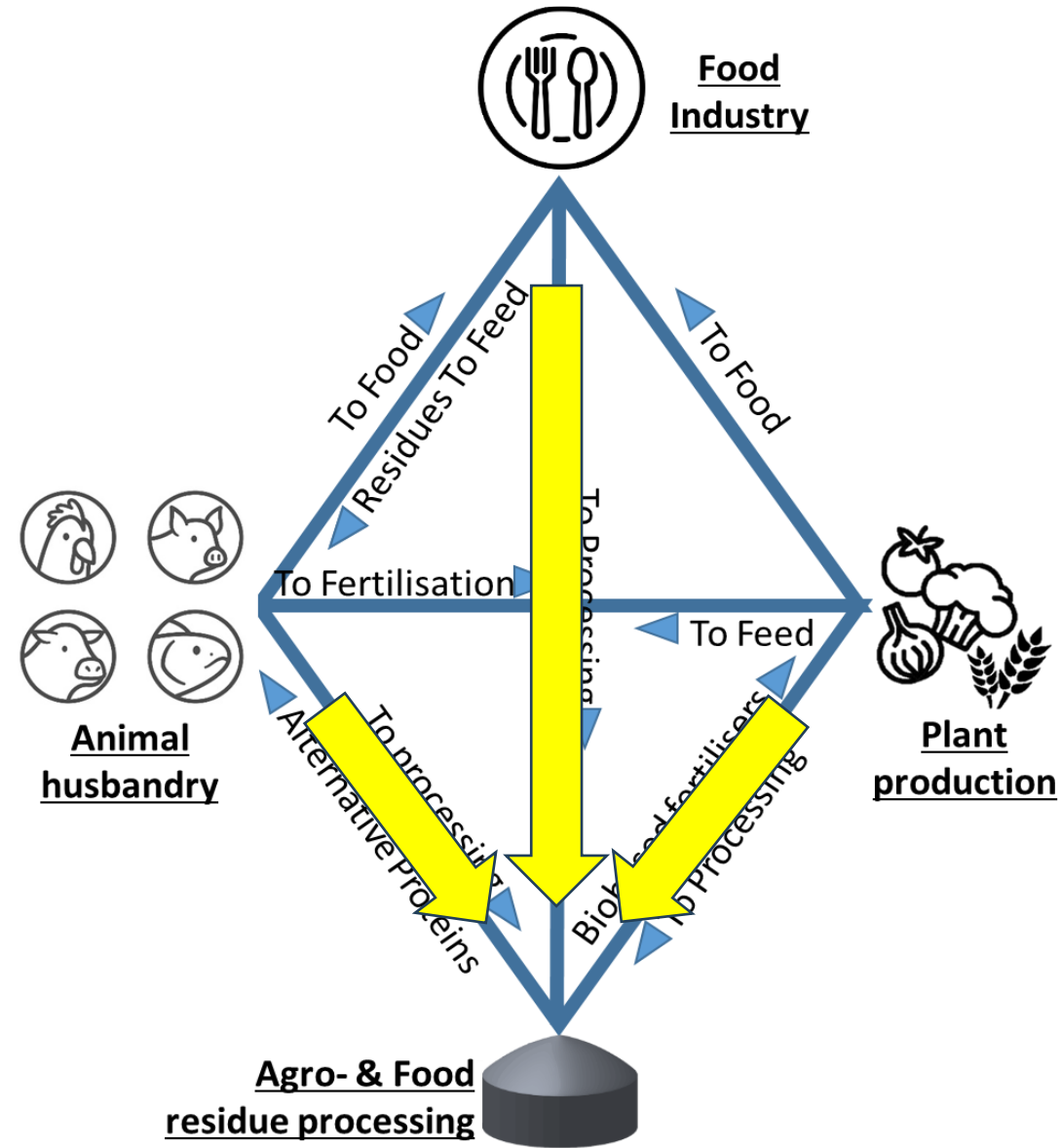
*Energy
Natural gas => N fertilizers (!)
P fertilizers => imported P-rock
Protein (feed)*



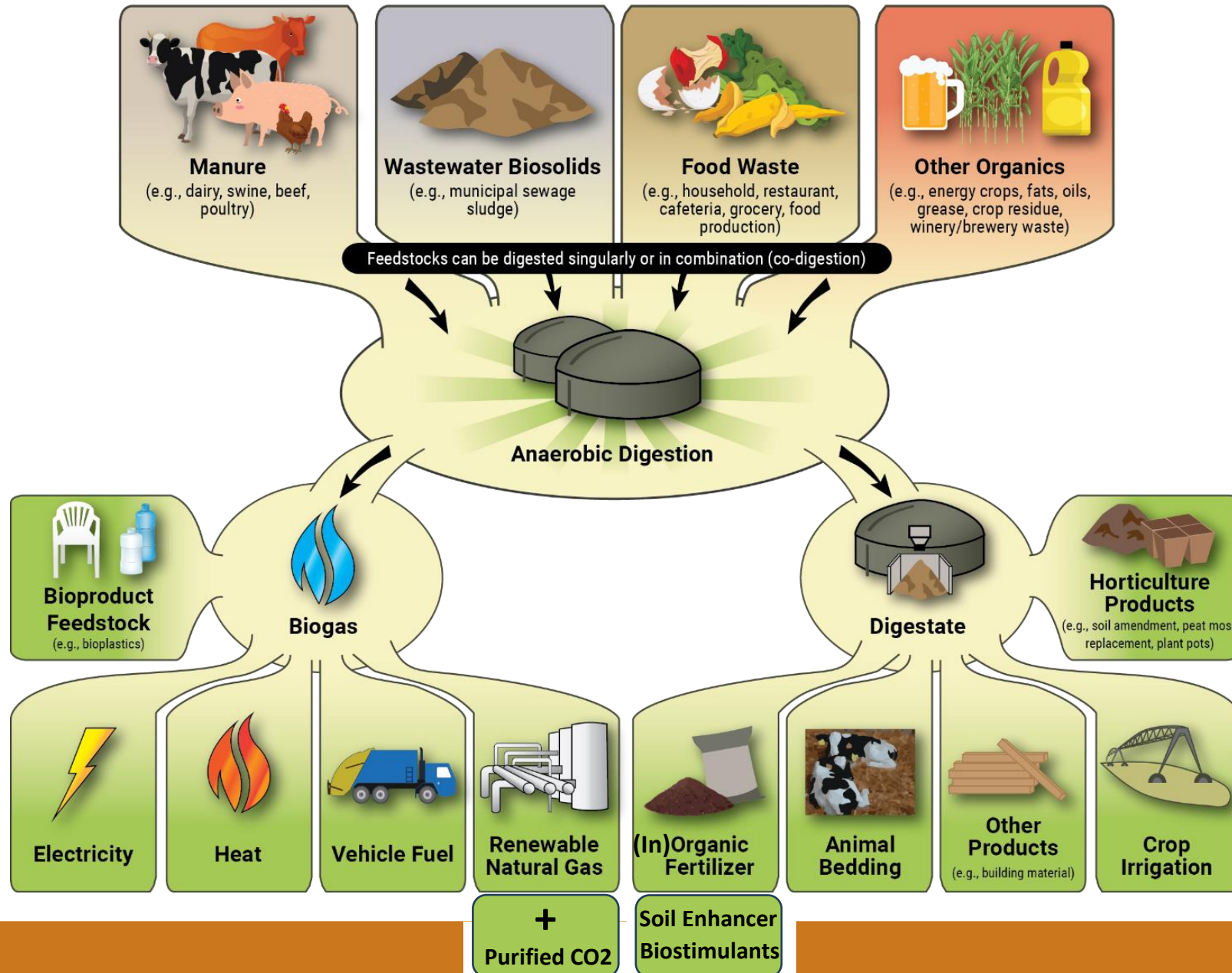




Closing loops



Biogas biorefineries



Presentation of the Report by Task Force 5.2

Improving Digestate Valorisation: Novel Technologies & Research Needs



BIOMETHANE INDUSTRIAL PARTNERSHIP

**IMPROVING DIGESTATE VALORISATION:
NOVEL TECHNOLOGIES & RESEARCH NEEDS**

SEPT 2024 // PREPARED BY TASK FORCE 5



Presentation of the Report by Task Force 5.2

Improving Digestate Valorisation: Novel Technologies & Research Needs



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II. Keys to success for implementing
R&D to business implementation
for nutrient recycling in europe



What are the keys of success of R&D on nutrient recycling in Europe

The success of R&D on nutrient recycling in Europe hinges on several key factors:

- 1. Innovative Technologies:** Developing and implementing cutting-edge technologies for nutrient recovery and recycling is crucial. This includes advancements in processes like anaerobic digestion, thermal and hydrothermal conversion, and membrane-based systems.
- 2. Collaboration and Knowledge Sharing:** Fostering collaboration among various stakeholders, including researchers, industry players, and policymakers, is essential. Platforms like the European Sustainable Nutrient Initiative (ESNI) and initiatives like the Nutrient in Europe Research Meeting (NERM) facilitate the exchange of scientific findings, solutions, and case studies ¹.
- 3. Sustainability Assessment:** Conducting thorough sustainability assessments of nutrient recycling technologies and practices is vital. This involves evaluating the environmental, economic, and social impacts of these technologies to ensure they are viable and beneficial in the long term.
- 4. Policy Support and Regulation:** Strong policy support and a favorable regulatory framework are necessary to promote nutrient recycling. This includes analyzing and adapting regulations to facilitate the practical use, application, and commercialization of recovered nutrients.
- 5. Market Acceptance and Stakeholder Engagement:** Ensuring market acceptance of recycled nutrients and engaging stakeholders throughout the value chain is critical. This involves addressing concerns related to the quality, application, and use of secondary fertilizers and building trust among farmers, consumers, and other stakeholders.

By focusing on these key factors, Europe can enhance the success of R&D efforts in nutrient recycling and contribute to a more sustainable and circular economy ¹.

¹ www.biorefine.eu

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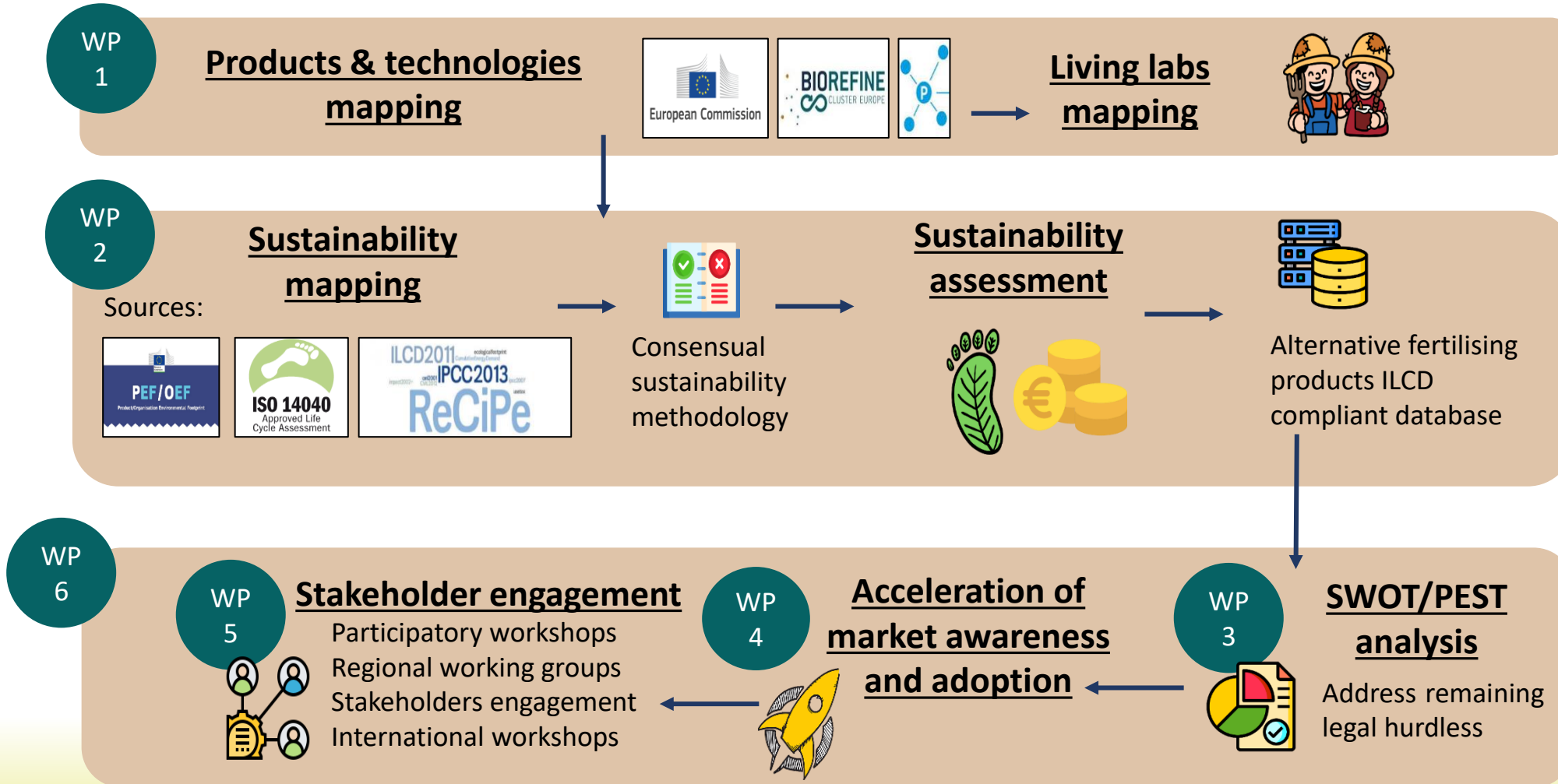


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NOVAFERT methodology





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Technology mapping

Primary technology categories

**Physical- chemical
nutrient recovery**

- Physical separation
- Stripping + Scrubbing
- Membrane filtration

**Biological nutrient
recovery**

- Composting
- Anaerobic digestion
- Microalgae technology

P precipitation

- Struvite precipitation
- CaP precipitation

**Thermochemical
nutrient recovery**

- Pyrolysis
- Combustion
- Thermal drying
- Hydrothermal carbonisation

TECHNOLOGY

PHYSICAL - CHEMICAL NUTRIENT RECOVERY

BIOLOGICAL NUTRIENT RECOVERY

P PRECIPITATION

THERMOCHEMICAL NUTRIENT RECOVERY

PRODUCT

Ammonium salt, scrubber water & mineral nitrogen concentrates

Compost and digestate

Struvite, K-Struvite, Ca Phosphate, vivianite

Ash, biochar and bio-phosphate
Granular / pelletised & powder



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Industry analysis of fertilisers market

The analysis of alternative fertilisers, market demands, and the pros and cons associated with their use offers a **balanced perspective on the opportunities and obstacles** in incorporating these products into agricultural practices.

The **identification of key industry players** and the competitive landscape analysis reveal the strategies and market positions that are shaping the industry's future.

Moreover, the customer segmentation and approach strategies highlight the **diverse needs and preferences of the market**, guiding more effective marketing and product development.



Market analysis



Customer segments



Behavioral analysis



Business model canvas



Specific customer relationship model

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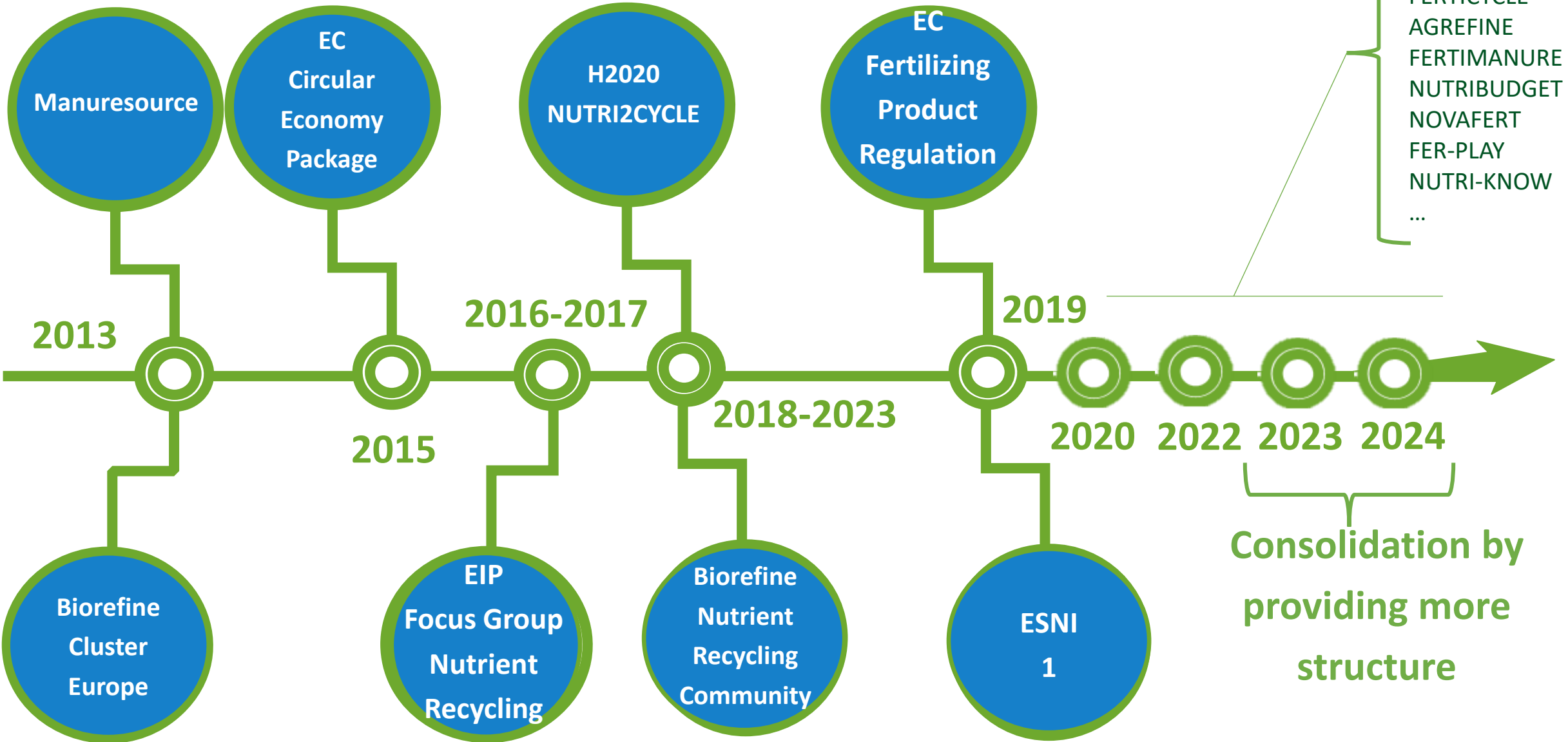
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AN ONGOING JOURNEY



ESNI COMMUNITY: OBJECTIVES AND ACTIVITIES



Nutrient Recycling Community was taken under the umbrella of the well recognized European Sustainable Nutrient Initiative (ESNI) going beyond annual conference

Mission:

- Foster collaboration among European entities in nutrient recycling.
- Facilitate experience exchange and identify knowledge gaps to guide future research.
- Enhance partnerships among stakeholders (private sector, policymakers, society).
- Contribute to advancing nutrient recycling technologies and knowledge.

Vision:

- Establish ESNI as a leading research reference in Europe for nutrient-related challenges.
 - Facilitate the adoption of research and innovation in nutrient recycling through member expertise.
-

ESNI COMMUNITY: OBJECTIVES AND ACTIVITIES

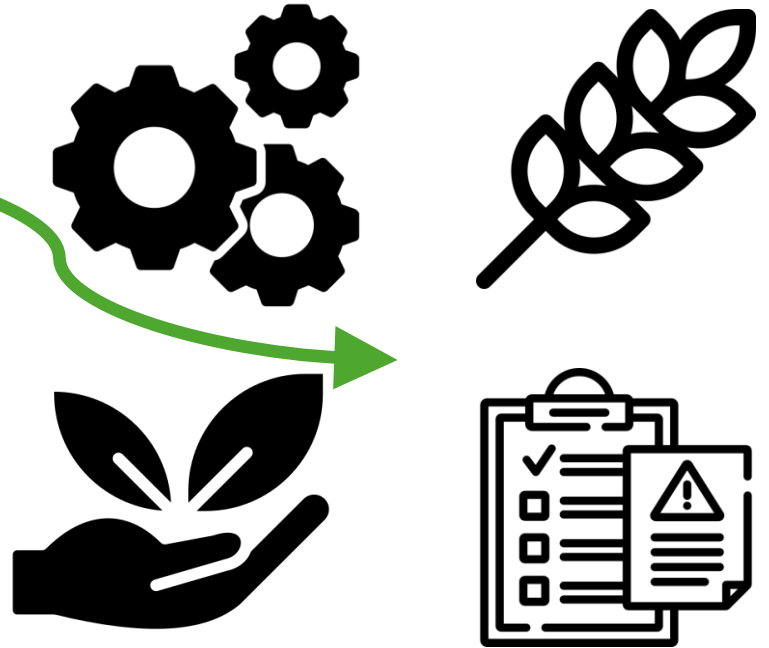
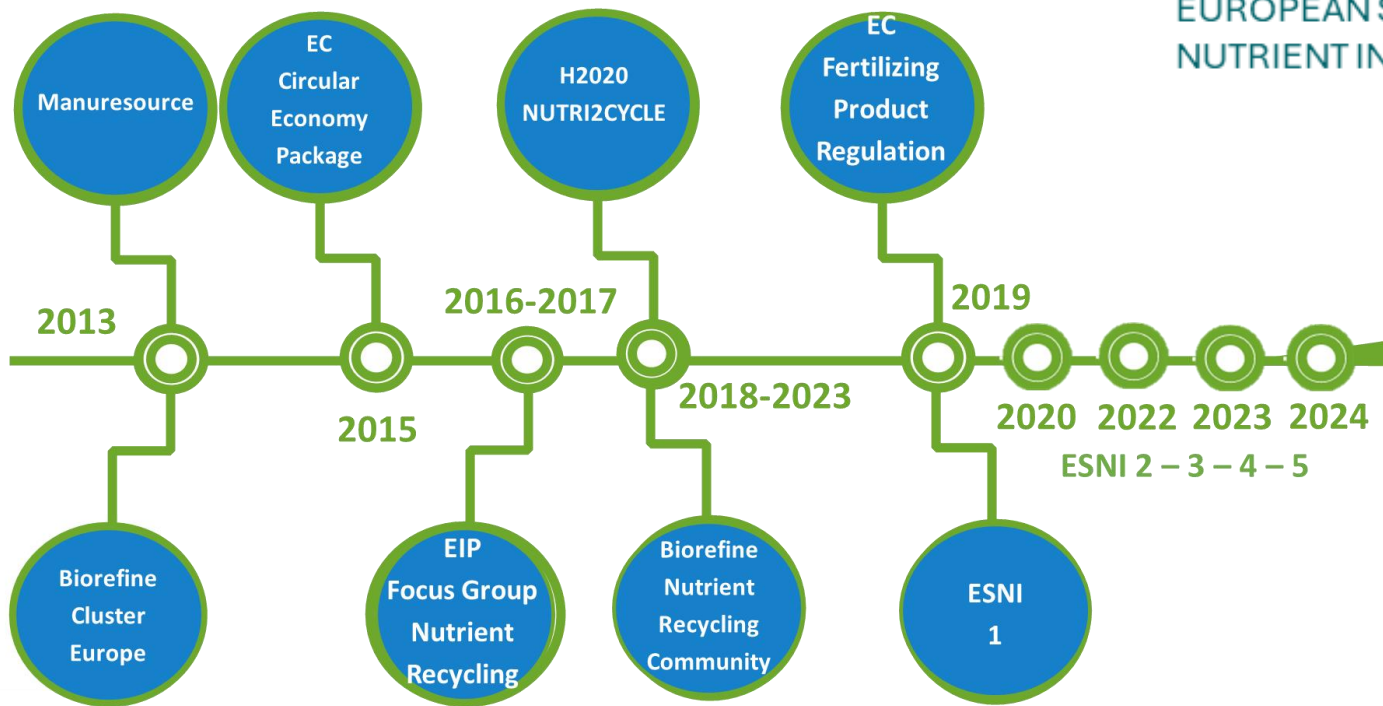


What kind of activities does ESNI promote?

- The annual event “ESNI Conference” associated with the annual ESNI General Assembly for the community members. Maintains its interconnection with the brand Biorefine Cluster Europe.
- Topic focused webinars
- Workshops and roundtables
- Joint activities and initiatives between projects (joint publications and experiments, staff exchange, joint proposals, etc.)
- Digital media (webpage, bulletin, social media, e-library)
- Participation and contribution as ESNI community in relevant events and conferences



AN ONGOING JOURNEY

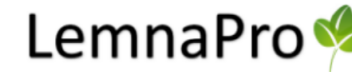


4 WORKING GROUPS



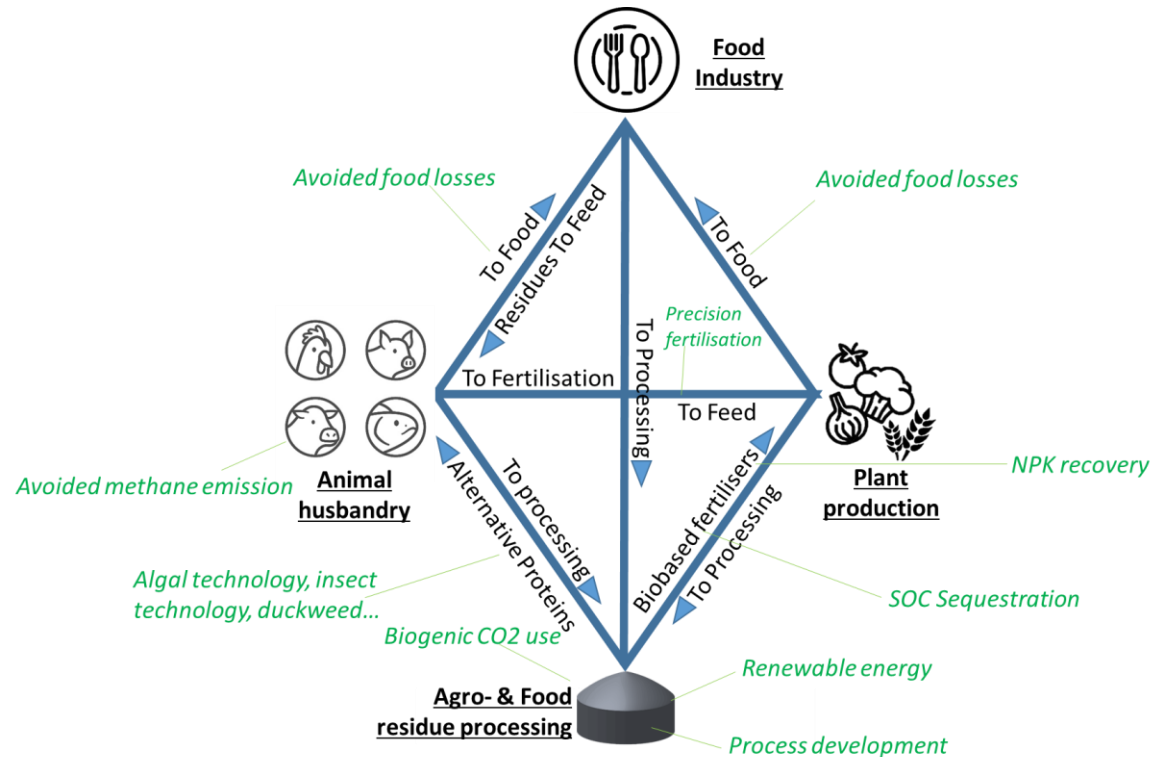
ESNI COMMUNITY: PROJECTS INVOLVED

More than 20 projects are already part of ESNI community



CONCLUSION

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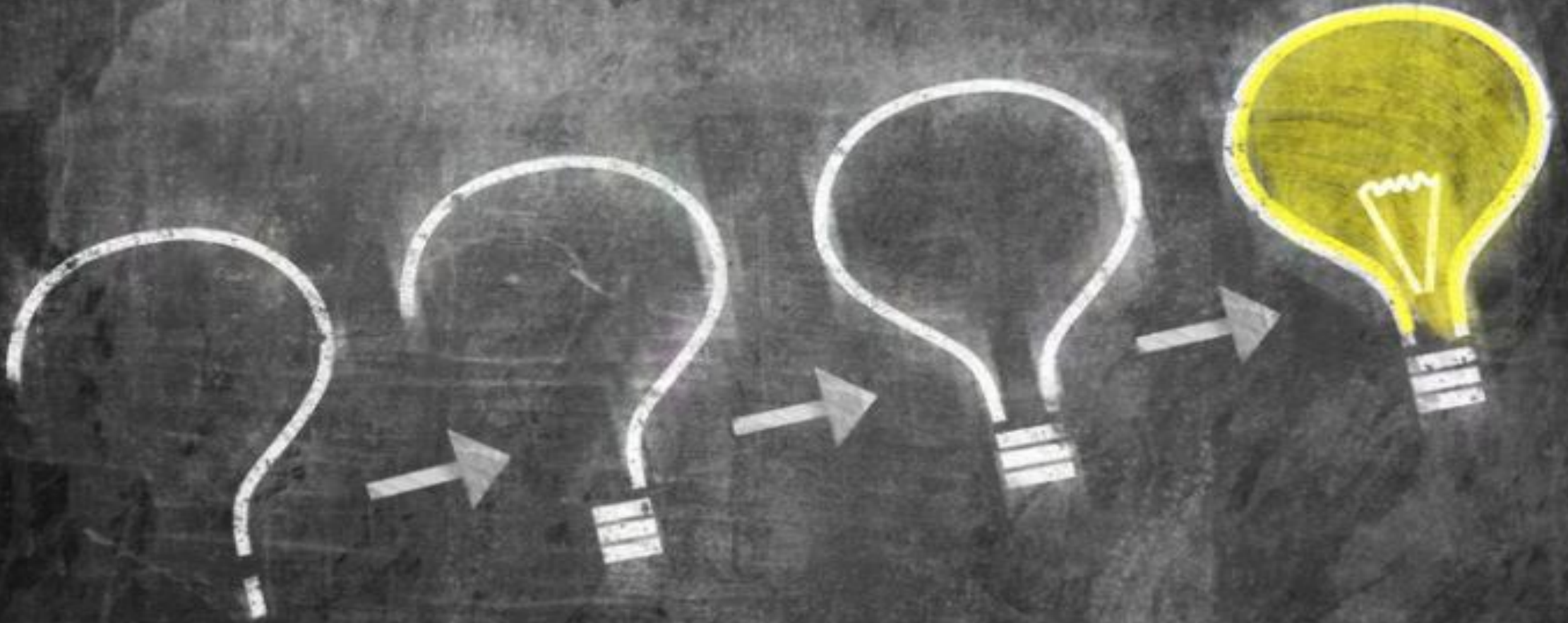


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ESNI
EUROPEAN SUSTAINABLE
NUTRIENT INITIATIVE

Questions ?



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erik.meers@ugent.be



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