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Sustainable agricultural sector: A key component of EU economic prosperity and security

An economic modellers' perspective

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A joint paper by the Horizon Europe projects

ACT4CAP27 BRIGHT SPACE LAMASUS Land Management for Sustainability

Horizon Europe Grant Agreement Numbers: ACT4CAP27 101134874 | BrightSpace 101060075 | LAMASUS 101060423

Interconnected challenges: Strategic agenda 2024-2029

European Council

A free and democratic Europe

The New York Times

In Germany, Far-Right Party Rises to 2nd Place in E.U. Election

The New York Times

entary Elections | What to Know | Takeaways | Far Right Wins Big | The Mood in Fi

French Far Right Wins Big in First Round of Voting

Europe News

EU elections: Austria's far-right FPÖ comes out on top in party first, exit polls show

A strong and secure Europe

The Guardian

Eur

Russia could be ready to attack Nato within five years, says secretary general

A prosperous and competitive Europe

https://www.nytimes.com/2024/06/10/world/europe/germany-afd-eu-election.html

https://www.euronews.com/my-europe/2024/06/09/austria-far-right-fpo-comes-out-on-top-in-party-first-exit-polls-show

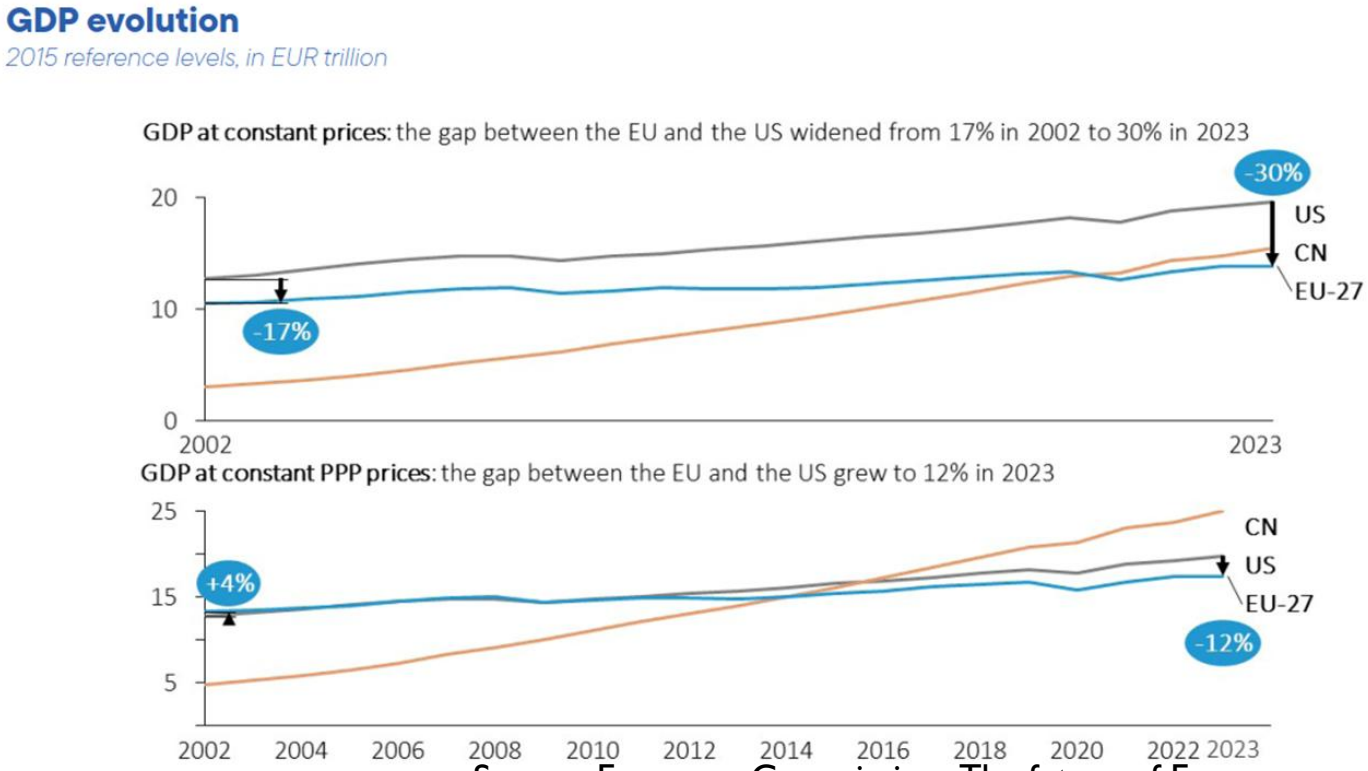
https://www.nytimes.com/2024/06/30/world/europe/france-elections.html

https://www.theguardian.com/world/2025/jun/09/nato-chief-russia-quantum-leap-defence

https://www.france24.com/en/live-news/20240916-europe-s-ev-troubles-bubble-up-at-brussels-audi-factory

Introduction: Business As Usual no longer possible

- The EU stands at a critical juncture
- The choices made in the coming years will determine whether the EU can maintain its global influence and its role as a leading world power or be marginalised with all the risks this entails

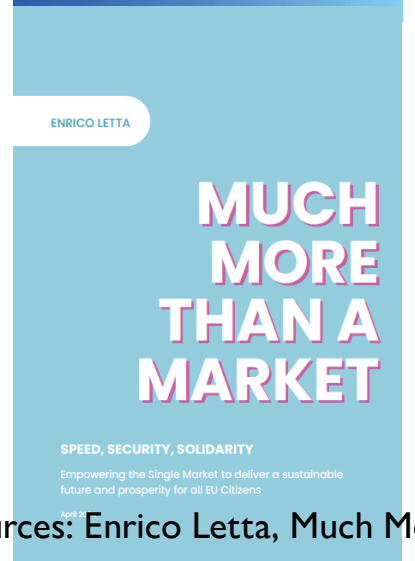


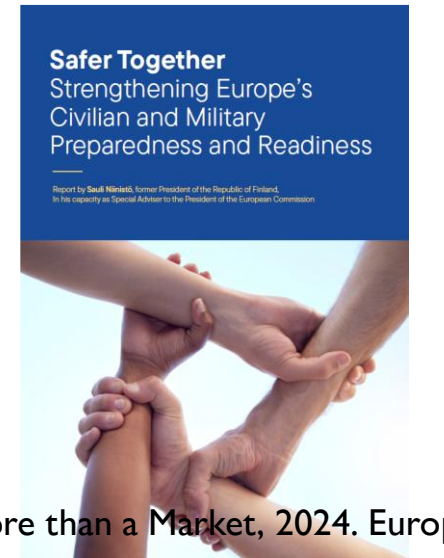
The way forward

Source: European Commission, The future of European competitiveness, 2025, licensed under CC BY-4.0.

- To reverse the trend
  - Boosting investments – double the Marshal plan
  - Focused action
  - Accelerated decision-making is needed

Source: European Commission, A vision for Agriculture and Food, 2025, licensed under CC BY-4.0.





- The importance of domestically produced food in **security has been recognized** in the **Niinistö report** as well as in the **EC Vision for agriculture and food**, which considers agriculture as a strategic sector
- The **economic relevance of the sector seems to be neglected**, as illustrated by its absence in the otherwise pivotal Draghi report

Sources: Enrico Letta, Much More than a Market, 2024. European Commission, Safter Together, 2024, both licensed under CC BY-4.0.

Our contribution?

- Common Agricultural Policy
  - €386.6 billion – 32% of the MFF 2021-27 budget
- Research and Innovation – Economic modelling for CAP development
  - Horizon Europe: ACT4CAP27 + BrightSpace + LAMASUS = €21 million

ACT4CAP27

BRIGHT SPACE

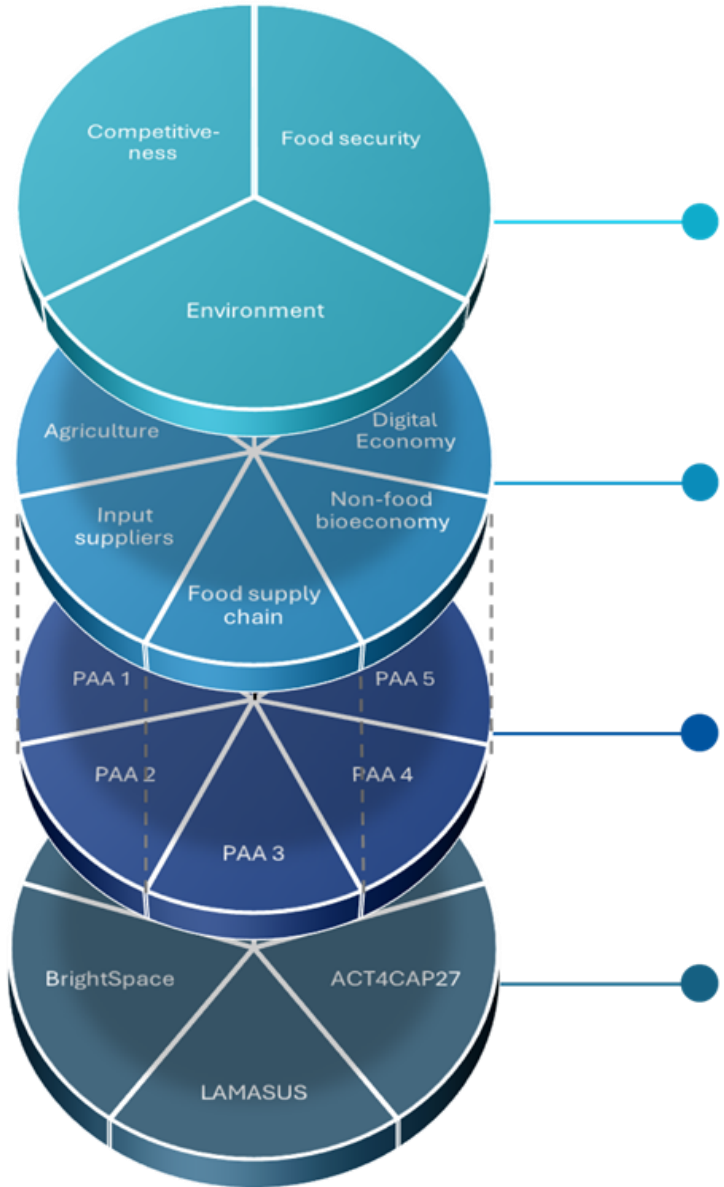
LAMASUS
Land Management for Sustainability

Economic modellers' perspective paper

- **Guiding the scenario analysis work** maximising the relevance of our projects in the new context & serving as a **basis for discussion with policy makers**
- Based on decades of experience of its authors in model-based policy impact assessment
- Contributors:
  - Project Coordinators: Tamás Krisztin (LAMASUS), Marc Muller (BrightSpace), Siemen van Berkum (ACT4CAP27)
  - Senior Researchers: Thomas Fellmann, Alexander Gocht, Hervé Guyomard, Paolo Sckokai, Davit Stepanyan, Peter Witzke
  - Project advisors: Alan Matthews & Tassos Haniotis
  - Technical support: Katalin Balázs & Dylan Bos
  - Paper coordinators: Hans van Meijl & Petr Havlík
- Initiated at a retreat in Laxenburg in January 2025

Economic modellers' perspective paper

Paper structure



Performance

Reinforced contribution of the agrifood sector to EU competitiveness, prosperity, and food security while enhancing environmental sustainability.

Economic opportunities

Primary agricultural production is at the heart of a complex supply chain with important multiplier effects.

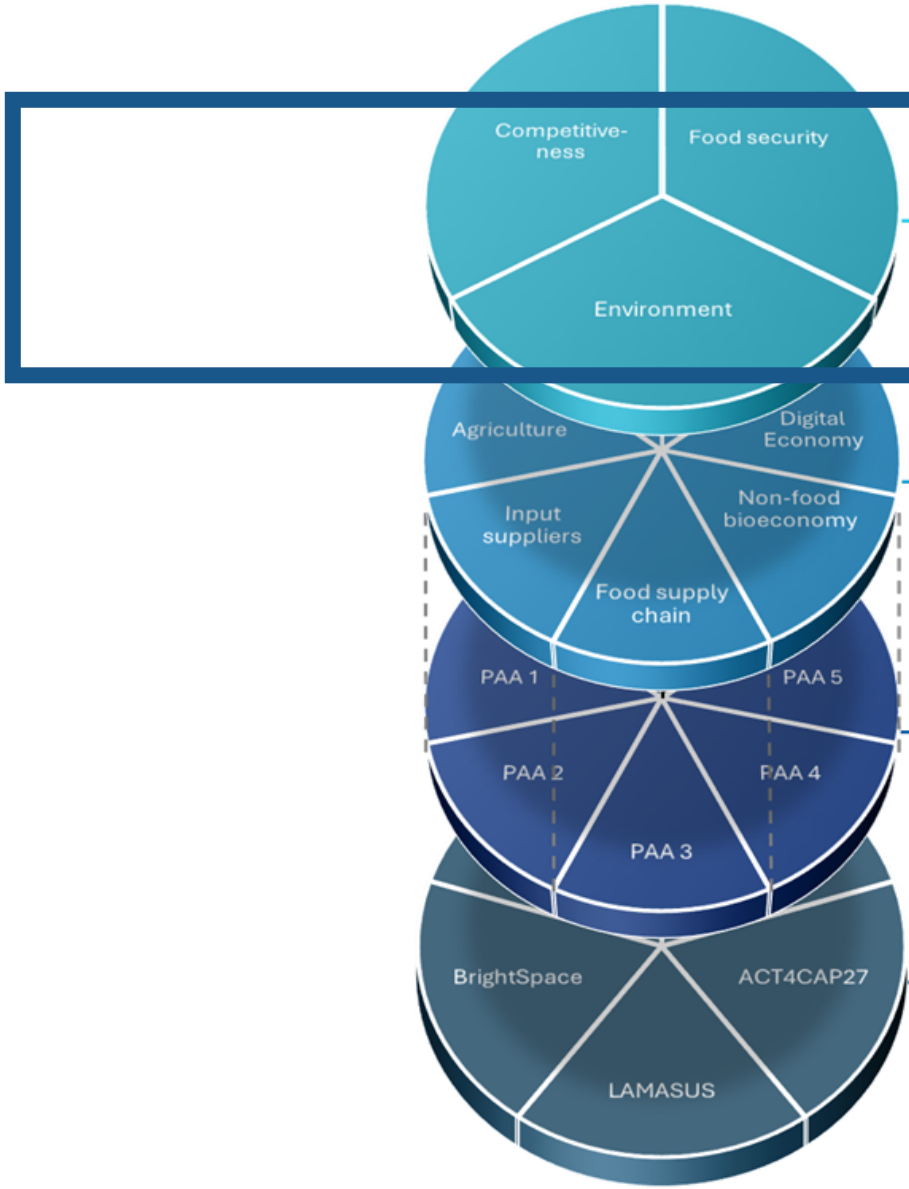
Priority action areas (PAAs)

Five Priority Action Areas (PAA) to untap the economic potentials together with food security and environmental sustainability.

Economic modelling

Economic modeling has been providing robust quantitative science-based underpinning for Common Agricultural Policy development for decades.

Current performance



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Current performance

- Competitiveness
  - The EU agricultural sector represents ~1.3% of the EU's GDP
  - €1 trillion in gross value to the EU economy, surpassing the EU automotive industry
  - Structural trade surplus of ~€70 billion in 2023, through exports of high-value processed goods

EU agri-food chain diagram

	Upstream	Agriculture	Food and drink manufacturing	Food and drink wholesale & retail	Food and drink services
		Agricultural produce & raw materials		Food & drink Products	
Activities/ focus	Animal health, crop protection, feed sector, fertilizers, machinery, seeds	Crop farming, livestock, forestry and fishing	Processing and/or manufacturing of food and drink products	Distribution of food and drink products – wholesaling; in-store, stalls and market retailing	Restaurants, fast foods, bars, cafés and food delivery services
Number of enterprises/ holdings (million)	0.01	9.1	0.3	1.1	1.6
Employment (million)	0.5	9.2	4.7	8.5	8.3
Value added (billion euro)	55.2	222.8	265.8	326.5	180.6
Turnover (trillion euro)	0.3	:	1.4	2.5	0.5

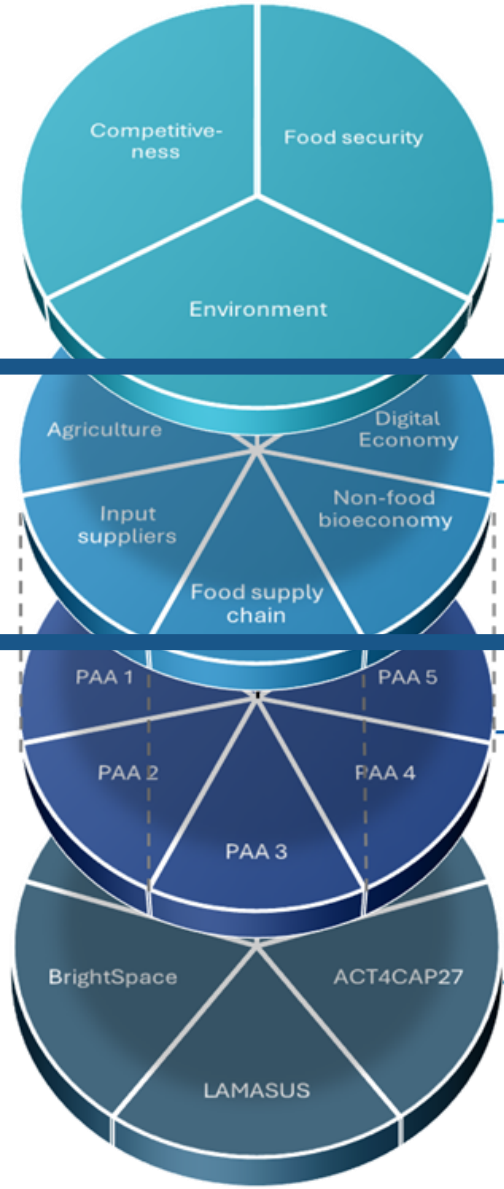
Logistics, storage and transport industries | Packaging industry | Service industry

Source: Tidjani et al., 2025 "The EU Agrifood Supply Chain" (based on Eurostat data)

Current performance

- Food security
  - The EU is self-sufficient in most (basic) food products
  - Critical dependencies on input imports exist – feed, fertilisers, energy
  - % of food-insecure EU consumers varies considerably (from 1.3% in Cyprus to 23.3% in Romania)
  - 36% of the adult population was classified as overweight and 17% as obese
- Environment
  - High GHG efficiency, relatively low absolute emissions reduction – 16% over the last 26 years
  - Environmental challenges persist – water overuse, soil erosion, nutrient pollution, biodiversity decline

Economic opportunities



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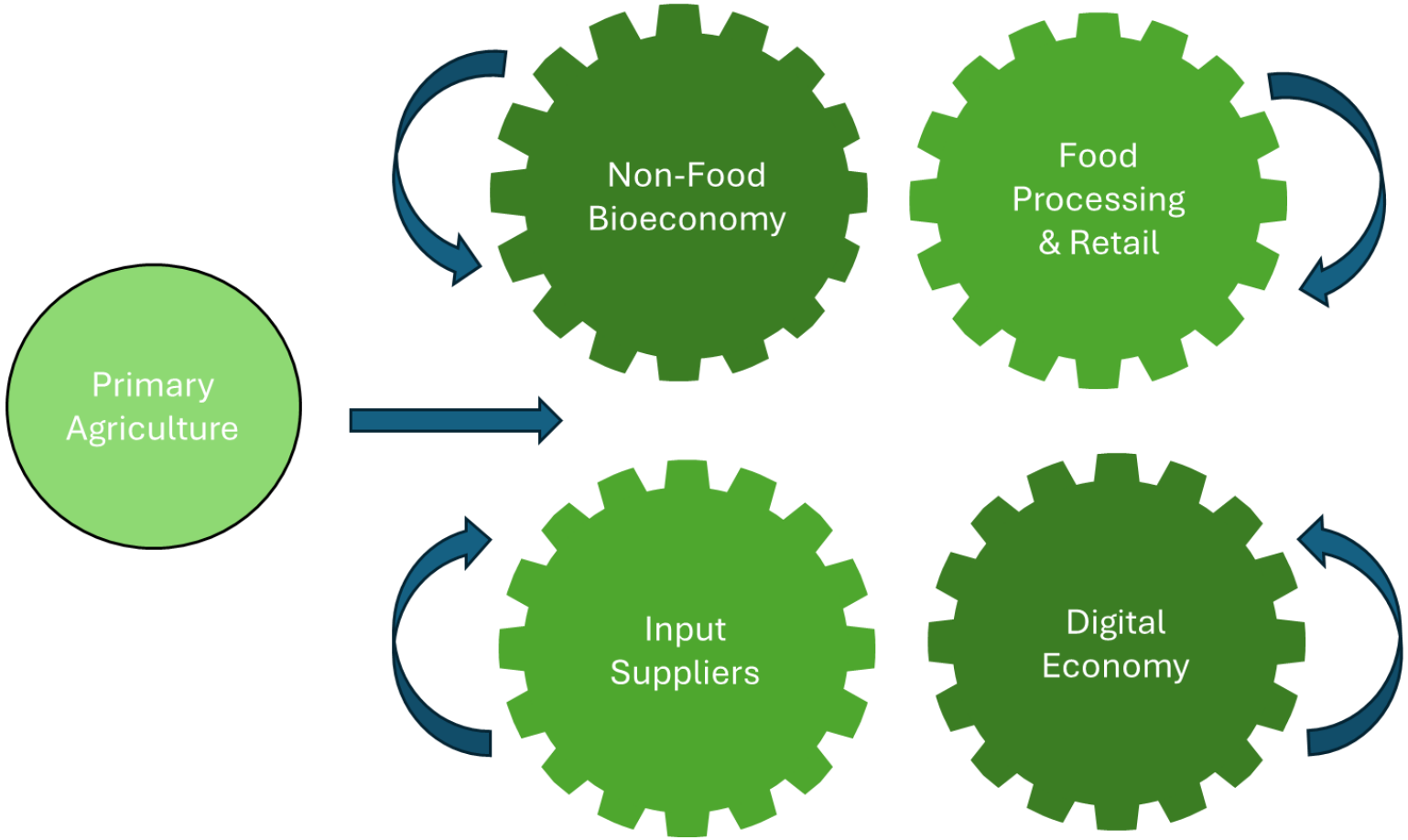
New economic opportunities

- Agriculture is the fuel of an important economic segment



New economic opportunities: Agrifood sector

- Input suppliers, primary agriculture, food processing and retail

- External factors
  - OECD/FAO project an annual growth in total food consumption of 1.1% over the next decade
  - Export volumes for the EU's primary commodities are projected to remain stable
  - A strategic strength in high-quality, safe, and healthy food products for emerging markets
  - Contingent upon an open international trade environment

- Internal factors
  - Steadily declining meat consumption (beef and pork)
  - Increasing demand for plant-based alternatives (pulses)
  - Growing demand for high-quality, nutritious, functional, and fortified food products
  - Targeted social policies for alleviating poverty and ensuring food access for low-income households

New economic opportunities: Non-food bioeconomy

- Non-food uses include biomass for
  - energy (e.g., wood)
  - construction (e.g., insulation materials, panels and boards)
  - textiles (e.g., cotton)
  - cosmetics and personal care (e.g., oils, waxes, extracts)
  - bioplastics, (platform) chemicals, and biobased materials

- EEA's Biomass Puzzle report: there is not enough sustainably available biomass in the EU

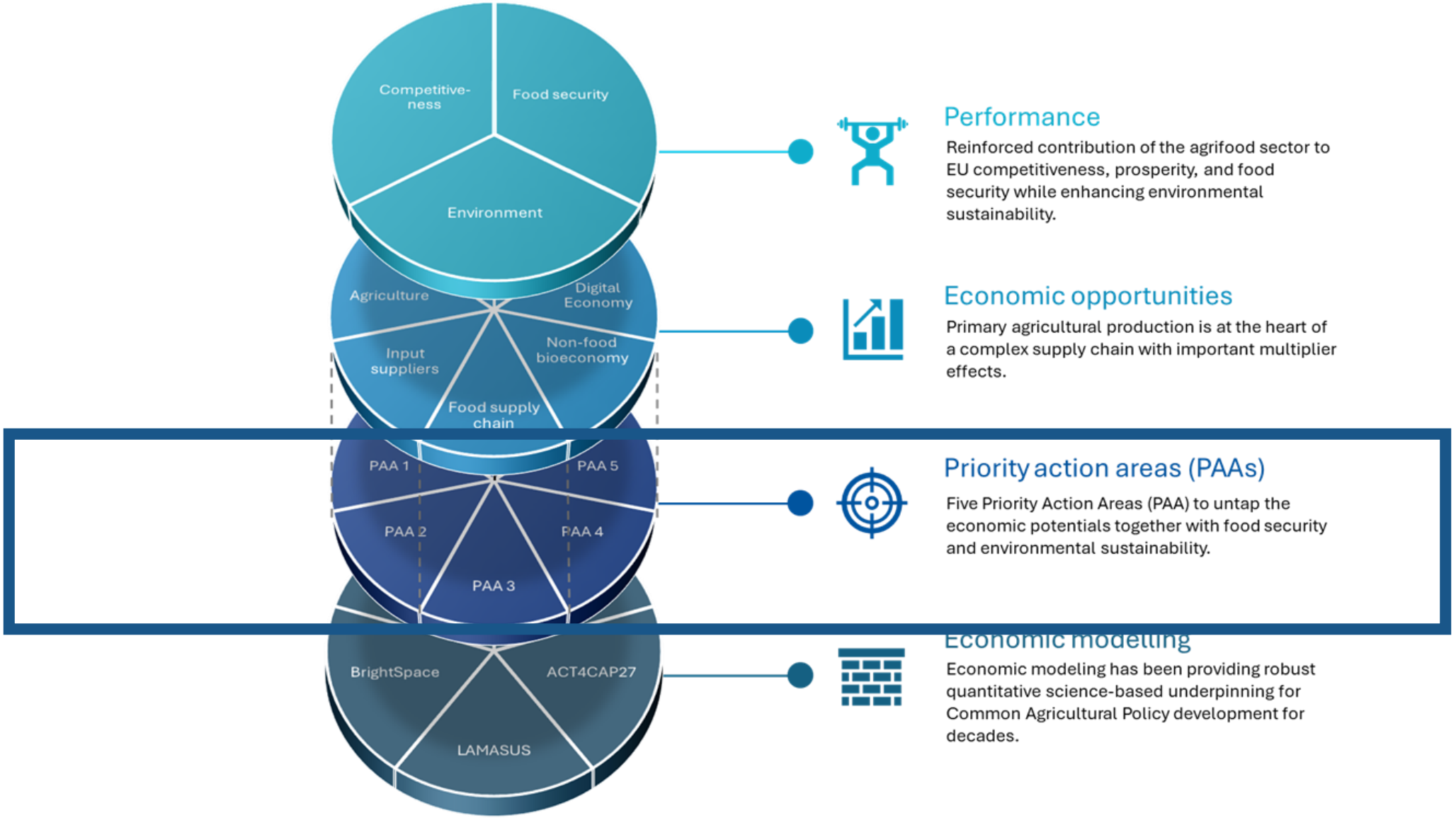
- By 2050, sustainably sourced agricultural and forestry biomass could supply at least 20% of the carbon feedstock required by Europe's chemical and material industry
- With advanced ag technologies, incl. artificial intelligence, precision farming, drones 40 %

- Synergies with the livestock sector, a split between protein and carbohydrate by the production of plant-based protein leads to higher availability of carbohydrates, good for chemicals and plastics

New economic opportunities: Digital economy

- AI, the Internet of Things (IoT), robotics, blockchain, and big data analytics
- Digital transformation in agriculture, when properly harnessed, enhances
  - Input and resource use efficiency
  - Can reduce input costs and environmental impacts
  - Resilience and agricultural productivity
- Digitalization in agriculture also substantial potential for streamlining administration
- Agricultural sector led innovation in related areas in the past, incl. earth observation
  - Can it contribute to fill the current R&D investment gap?
- Current skill sets of many farmers limit utilization of digital technologies

The Five Priority Areas



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1. Fostering income & resilience by result-based policies

- Reducing the ecological footprint of EU agriculture will be easier if the measures adopted do not compromise farm viability and resilience, and if they entail minimal administrative constraints.

- The growing maturity of environmental observation solutions has the potential to shift from environmental policies based on obligations of means (practices), compliance with standards, and compensation for income losses, to policies focused on obligations of results (impacts), incentives, and payments proportional to the services delivered.

- Sustainable benchmarking at the farm level to identify priority action areas & guide targeted improvements.

- Technologies, including Artificial Intelligence (AI), that facilitate automated monitoring systems

- Developing markets for environmental services—such as nature farming— or integrating agriculture into existing markets like carbon farming

2. Integrated nutrient management for strategic autonomy

- Nitrogen and phosphorus pollution are a great environmental challenge
- Reliance on synthetic fertiliser imports is one of the most critical dependencies of the EU agricultural sector
- Taxation of nutrient losses at the farm level with tax revenues redistributed to farmers
- Promoting protein crops for more sustainable and self-reliant farming systems
- Adoption of decision-support tools and precision fertilisation technology
- Development of a European supply of green fertilisers
- Manure recycling and reduction of transport costs : Opportunity for additional income for livestock producers.

3. Enhancing the agrifood competitiveness & maintaining food security through level-playing field trade agreements

- The EU agrifood sector can strongly benefit from export opportunities, which can also strengthen the geopolitical role of the EU
- Bilateral Free Trade Agreements diversify trade relationships and open up new opportunities for EU agricultural products
- Adopt measures that compensate for the higher costs EU farmers face due to strict rules on environmental protection, human health, animal welfare, plant health, and food safety in comparison to trade partners.

4. Fostering innovation leadership in the new bioeconomy

- With the ambitious climate mitigation targets, the demand for biomass for non-food uses, such as materials, chemicals, or bioenergy, will become the dynamic sector, in which the EU still has technological leadership
- Support for research and development to drive innovation and open up new uses for agricultural outputs
- Encouraging the collection and use of crop residues and food waste can help supply raw materials for emerging sectors like bioplastics
- Developing robust systems for carbon credits

5. Democratising digitalisation to ensure agricultural sector attractiveness and technological innovation

- Digitalisation has a great potential to transform the agricultural sector into a highly attractive, profitable, and environmentally friendly business
- Risks of favouring the already well-off large farms at the expense of the large majority of small farms, thus contributing to uniformisation of agrifood products without respecting the European way of life/eating
- Without EU tech companies catching up, new critical dependencies on imported technologies will arise
- Capacity building and targeted support for small and medium-sized farms and enterprises
- Encouraging direct marketing options, such as online sales platforms
- Continued support for research and development (R&D)

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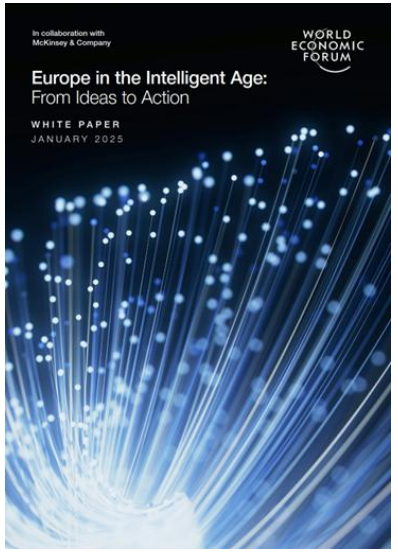
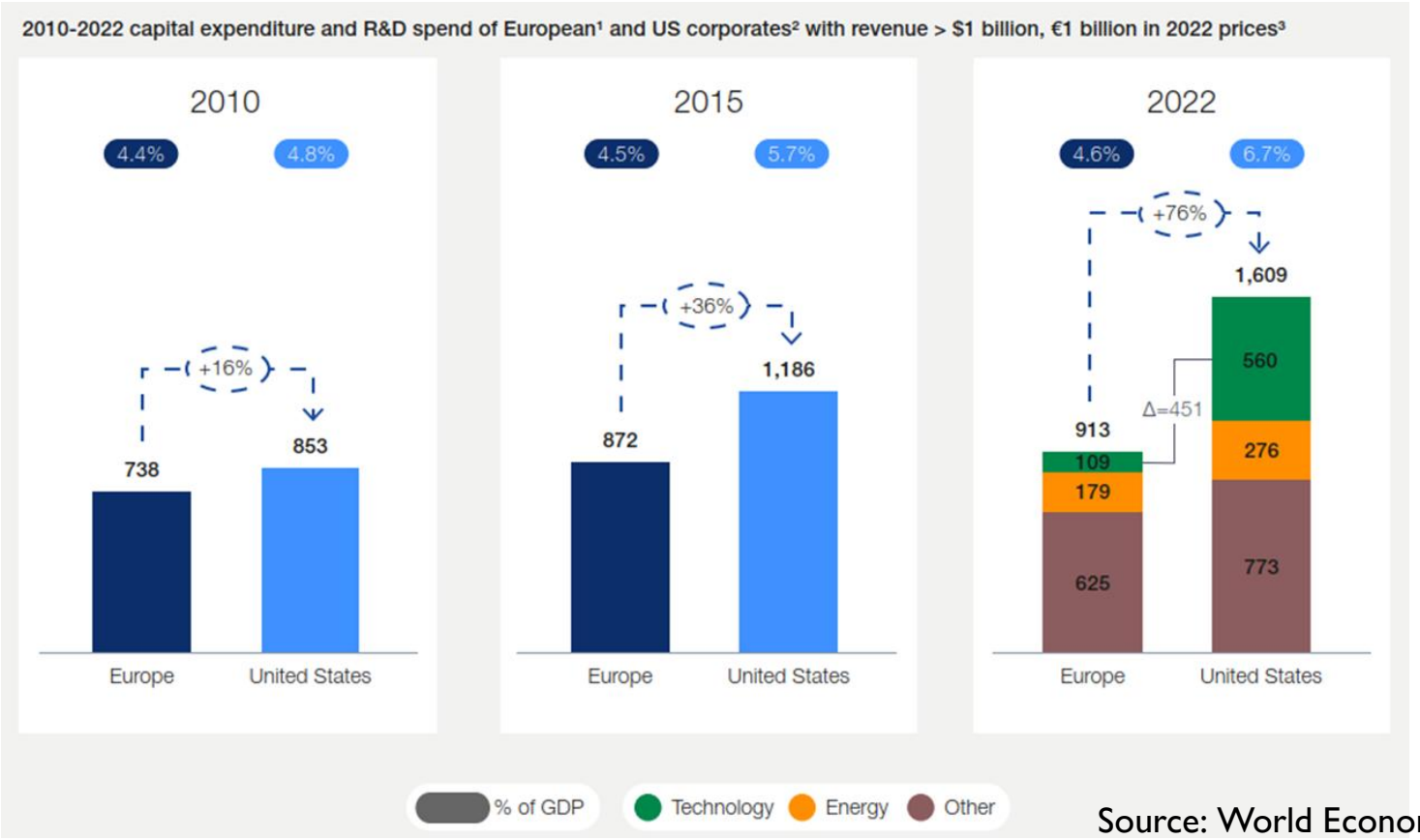


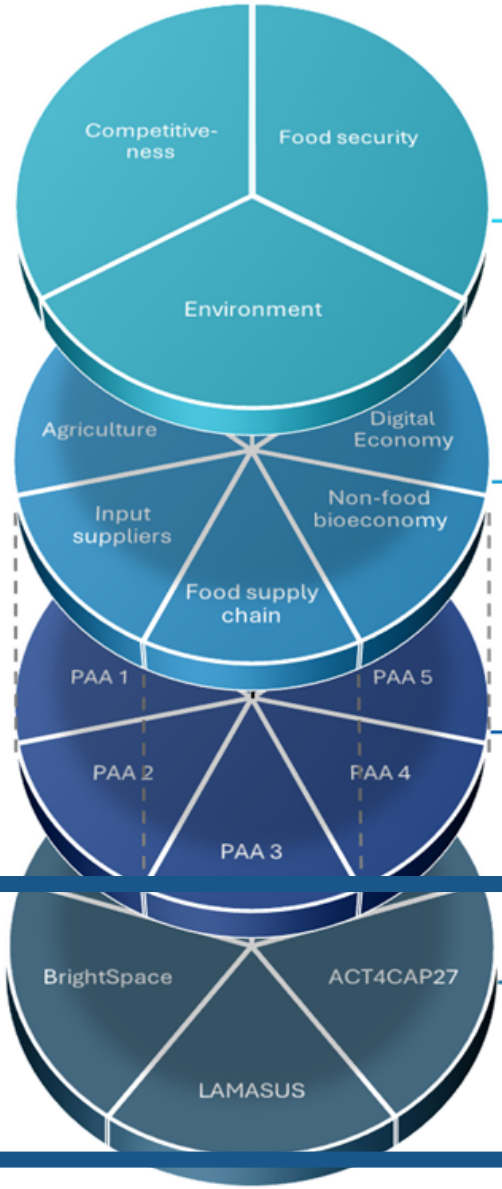


- Can agriculture related investment add EUR 100 billion?

- EUR 50 billion in the CAP
- EUR 30 billion – development of monitoring systems and (public) digital infrastructure
- EUR 20 billion – research and innovation

Source: World Economic Forum, Europe in the Intelligent Age, 2025, Figure 1, licensed under CC BY-NC-ND 4.0.

5 plus 2 future economic modelling needs



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1. Strengthening the connection between agroeconomic and environmental modelling by enhancing the **integration and mutual processing of spatial input and output data**

- Jointness that exists between economic and environmental outcomes at the farm level\agricultural systems
  - valuation of ecosystem or environmental services (e.g. carbon\nature farming)
  - the impact of practices on soil health
  - the nuanced influence of changing climate on agricultural systems

- This is enabled by increasing wealth of information, facilitated by automated (AI-driven) monitoring systems, that is available on spatial data, primarily for soil, but also where accessible for water or biodiversity metrics

- The **almost real-time model-data** fusion would also improve accountability within agricultural policies

2. Strengthening representation of **Integrated Nutrient Management**

- Enhancing **livestock** representation (still rudimentary in most models) and integration with crop sectors
- Production and adoption of green fertilisers
- The use of precision agricultural technologies
- The adoption of **circularity** practices (e.g. manure).
  - Beyond farm-level cycles also food waste and human excreta.

3. Bilateral **trade** agreements modelling, including **sustainability provisions** and **regulatory asymmetries**

- Incorporate the set of emerging non-tariff measures
- The use of tariffs as “reciprocal” or retaliatory means to impose domestic policy priorities on international trade

4. Full integration of the agrifood sector into the broader **bioeconomy**

- Enhanced modeling of the **food system**
- Links between agricultural production and the evolving food and non-food demand for bio-based materials, bioenergy, biobased-chemicals, and biobased-pharmaceuticals
- Enhanced representation of the **multiplier effects** in both upstream and downstream sectors
- Enhanced options offered by biotechnology
  - "Balance crops and societal needs"
    - Protein crops : Protein for feed & carbohydrates for biomaterials

5. **Endogenizing knowledge and innovation processes**, including the role of digitalization

- Technological change has a critical role as an essential engine of supply-side transformation
  - Endogenize this black box on supply side
    - from R&D to innovation & adoption, including national and international knowledge spillovers
  - Identifying enablers of and barriers to innovation adoption
  - Add model parameters that better represent impacts of investments in technology on yields and other economic, social, and environmental indicators.

- Strengthen analysis of systemic impacts of potentially **transformative technologies**, e.g., **digitalization**

1+ Extending the modeling of shifting **consumer behaviour** to represent the potential impact of demand-side transformations

- Rather well-known changes due price and income effects

- Endogenizing changes in consumer preferences
  - E.g. protein transition
  - Dealt with in an exogenous way (assumptions) => open this black box on demand side
- Nudging behavioral change
  - Evidence

2+ Climate change impacts and adaptation, incl. **weather extremes**

- Standard policy impact assessments and outlook exercises ignore climate change entirely, or at best consider the gradual shifts in average climatic variables
- New methodologies need to be developed to mainstream climate change impacts, including extreme weather events, into these assessments
- Explicit modelling of **dedicated adaptation options** is needed to capture their potential role in shaping supply-side responses

The Draghi report:

One year on

High-level conference on competitiveness
16 September 2025

Mario Draghi:

- One year on, **Europe is therefore in a harder place**. (E.g. since December last year, China's trade surplus with the EU has risen by almost 20%.)
- **Our growth model is fading**. Vulnerabilities are mounting. And there is no clear path to finance the investments we need.
- To carry on as usual is to resign ourselves to falling behind. A different path demands new **speed, scale and intensity**.
- And it means **delivering results within months, not years**.

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A key component of EU economic prosperity and security

Thank you

Access the perspective paper

https://doi.org/10.5281/zenodo.16413131

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Unlocking the Potential of the Agri-Food Sector: Insights, Enablers, and the Road Ahead

Chapter 1

An Overlooked Sector in a Changing Context

Agriculture and food are at the heart of Europe's strategic autonomy, green transition, and economic resilience.

Chapter 2

Economic Modelling

In Support of Better Policy

Economic modelling supports evidence-based policy for food security, sustainability, and competitiveness.

Chapter 3

Current Performance

Where We Are Today?

Agri-food Competi-tiveness | **Food Security** | **Environ-ment**

The sector shows mixed performance across key indicators — action is needed.

Chapter 5

Enablers / Policy Levers

Fostering income & resilience via result-based policies

Integrated nutrient management for strategic autonomy

Digital inclusion in agriculture

How Do We Unlock the Potential?

Fair trade & food sovereignty

Innovation in bioeconomy

GOAL:
Food security
+
Sustainability
+
Economic potential

Chapter 4

Economic Opportunities

Where Can Growth Come From?

Agri-food sector | **Non-food bioeconomy** | **Digital economy**

Chapter 6

Future Modelling Needs

Looking Ahead: Better Models for Better Policy

New models must capture complexity, uncertainty, & real-world dynamics to inform next-gen policies.

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