



Innovation in Agriculture: Digital and Ecological Transformation from Policy to Practice



European Green Deal, Sustainability and the Future of Human Capacity



2050 Vision: European Green Deal

5 core pillars to restore a healthy balance in natural ecosystems.

1 Climate Neutrality: Net-zero emissions through the reduction of greenhouse gas emissions.

2 Circular Economy: Zero waste through the repair and reuse of materials.

5 Sustainable Agriculture: Healthy and accessible food through ecological practices.

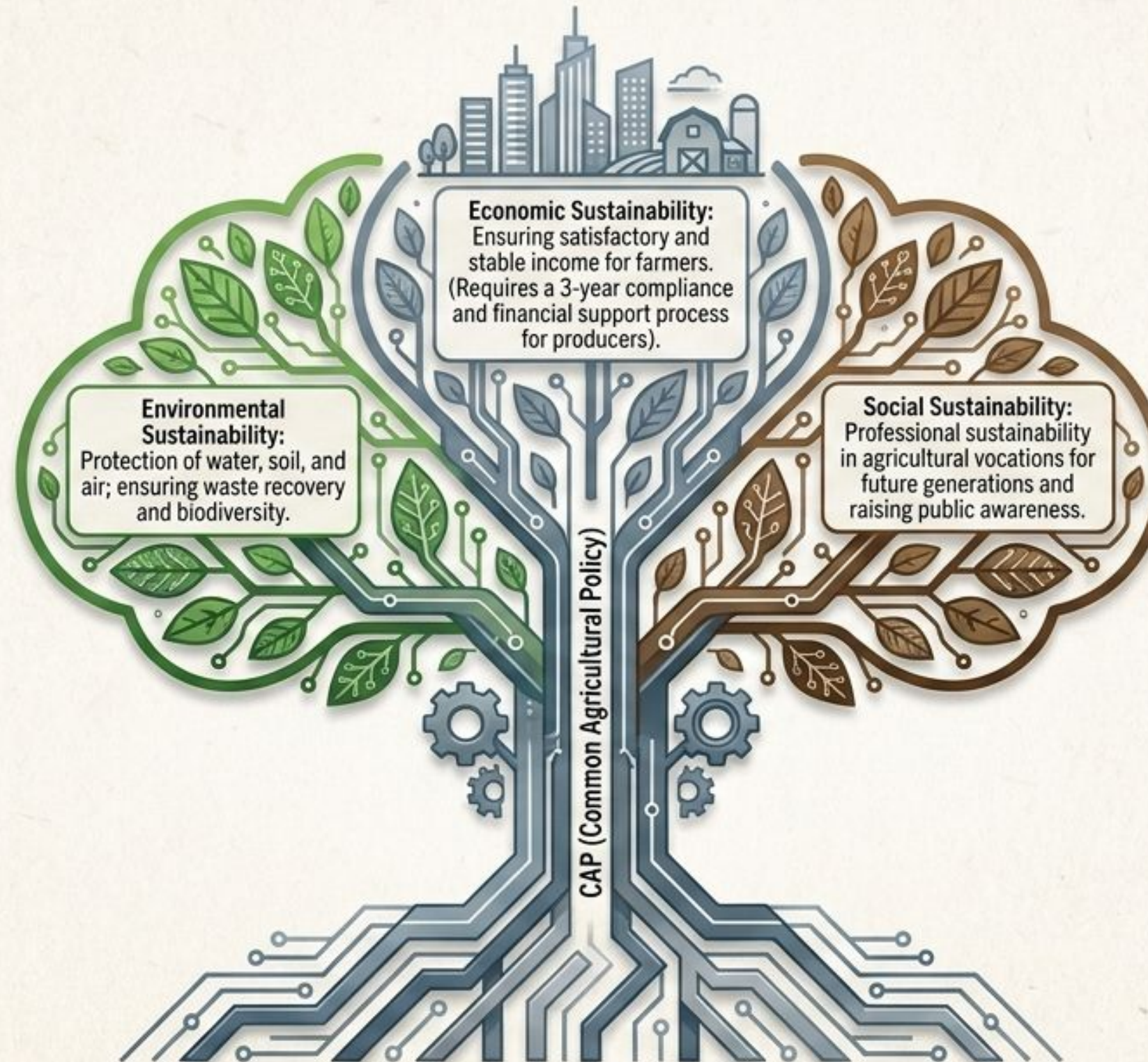
4 Healthy Environment: Minimizing pollution based on respect for nature.

3 Clean Industry: Energy-efficient and sustainable industrial policies.

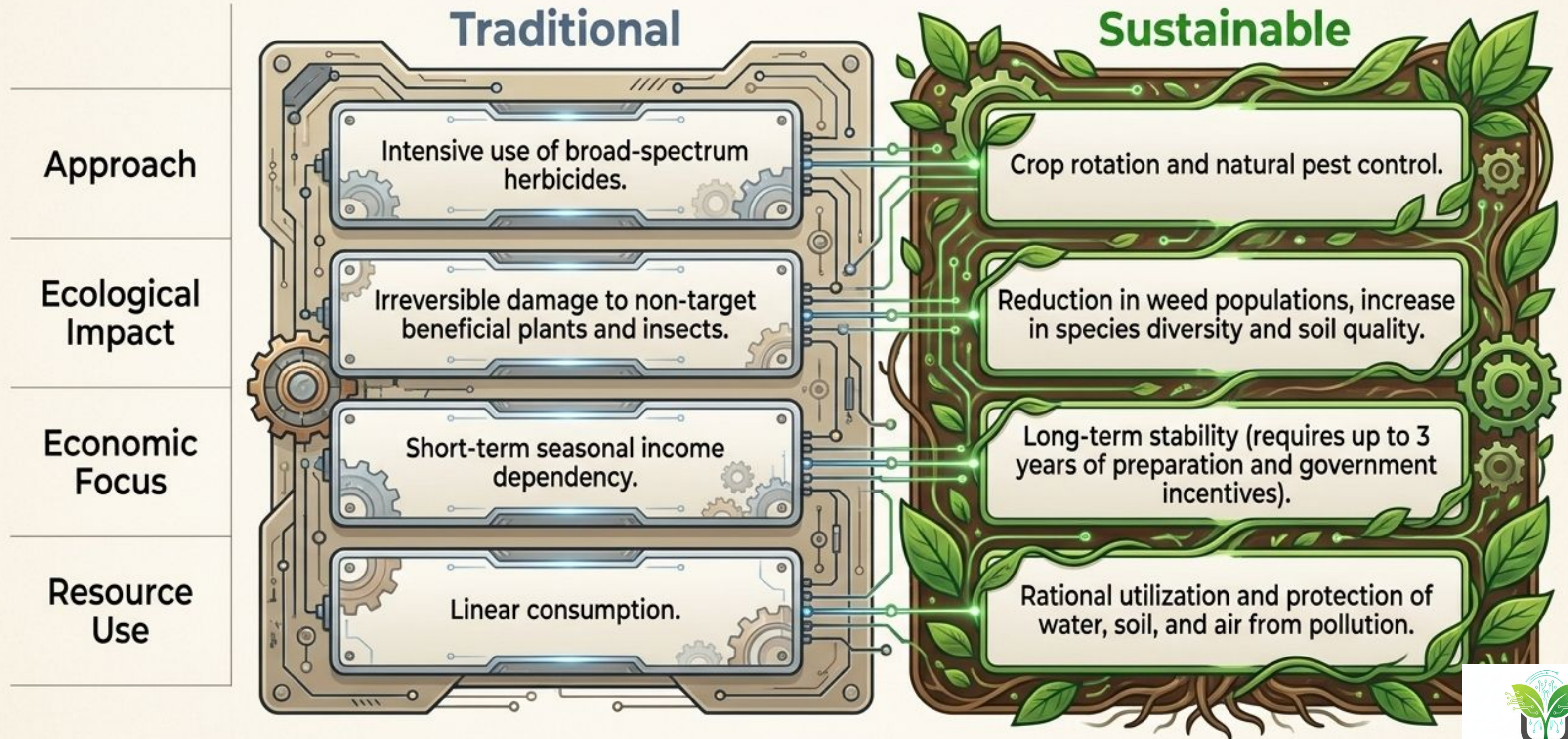


Foundation of the Transformation: Common Agricultural Policy (CAP)

In the European Union, agriculture is at the heart of society, environment, and economy. National strategic plans rely on three foundational pillars:



Operational Comparison: Traditional vs. Sustainable Agriculture



Natural Resource Management: Soil, Water, and Air

The foundation of the bioeconomy. Provides carbon storage, water regulation, and nutrient cycling. It is a non-renewable resource.

Soil

Water

Ammonia -> Water & Soil:
Leads to nutrient overload (eutrophication) and soil acidification.

Under threat from climate change (droughts and floods). Central to the 2030 zero pollution target.

Air

Methane: Originates from animal digestion; pollutes the terrestrial environment.

PM10: Particulate matter released into the air from biomass burning.

Agriculture is a major polluter:
93% of total EU ammonia emissions (fertilizer/synthetic nitrogen) originate from agriculture.



Engine of Transformation: Eco-Schemes

The new element of the CAP 2023-2027 period: A system that rewards farmers as stewards.



Organic Farming Rules: Farm to Fork Standards

Target 2030: Transition of 25% of total agricultural land to organic farming (Regulation EU 2018/848).

25%

Prohibited / Restricted

- ✗ - Genetically modified organisms (GMOs).
- ✗ - Use of radiation.
- ✗ - Hormones, synthetic nitrogen fertilizers.
- ✗ - Restriction of antibiotics, chemical herbicides, and pesticides.

Encouraged and Mandatory Practices

- ✓ - Appropriate and planned planting (sustainable crop rotation).
- ✓ - Use of nitrogen-fixing plants.
- ✓ - Selection of resilient species (seeds/rootstocks).
- ✓ - Use of organic plant reproductive material (supported by National databases).



BASIC PRINCIPLES OF ORGANIC FARMING

1 Seeds

- 1 No Use of Genetically Modified Organisms

2 No Use of Genetically Modified Organisms

- No Use of Genetically Modified Organisms

7 Reduce Diseases

- 7 Minimize Disease Impact Through Resistant Varieties and Improved Growing Techniques

3 Radiation

- No Use of Radiation

4 Chemical Pesticides & Herbicides

- Limit the Use of Chemical Pesticides, Herbicides, and Parasitocides

5 Hormones & Antibiotics

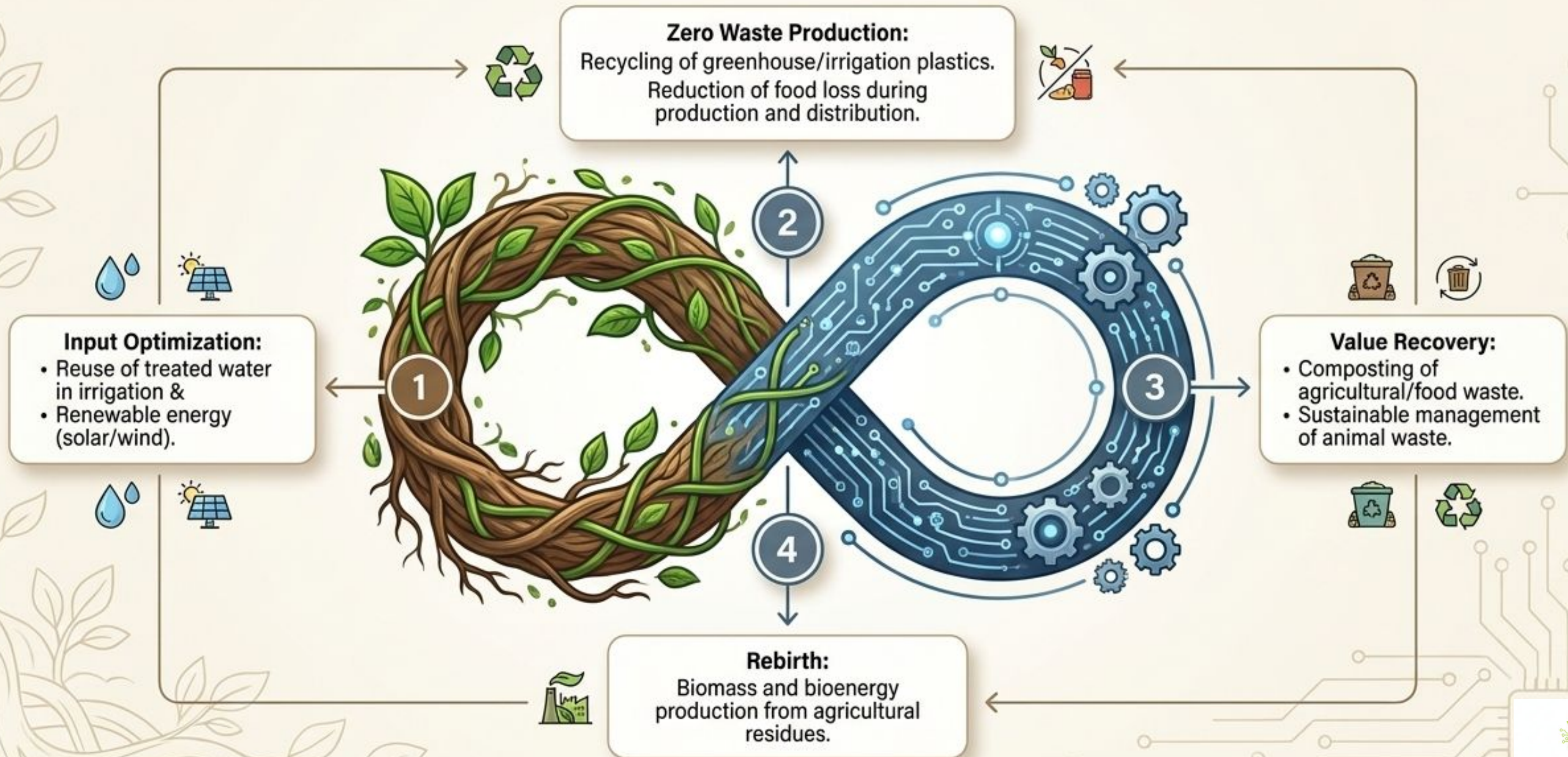
- Prohibit the Use of Hormones, Restrict the Use of Antibiotics

6 Nitrogen Fixing

Use Cultivation Methods That Fix Nitrogen and Restore Soil Fertility Naturally

Closed-Loop Ecosystem: Circular Economy in Agriculture

Sustainable transformation that preserves resource value, moving away from the 'Produce – Consume – Dispose' model.



Innovation Impact Panel: Farm of the Future



Water and Chemical Reduction

Radical decrease in **water, pesticide, and herbicide** use compared to traditional production; increase in final product quality.



Artificial Intelligence and Yield

High-accuracy timely intervention. Maximum yield increase per unit area.



Energy Independence

The end of **fossil fuel dependency**. On-farm wind turbines and photovoltaic systems.



Spatial Innovation

High yield even in small areas with **vertical farming systems**. Bringing production closer to consumption points (lower transport costs).



Timeless Production

Climate-independent, stable year-round production of seasonal crops.



Employment and Society

Transition from physical labor to technological management. New **job opportunities** for youth and strengthening of rural life.



Key to Integration: Human Capacity and Skills

Modern agriculture relies not just on sensors and machines, but on human intelligence adapting to new challenges.



Digital Adaptation: Training for farmers and agricultural workers on digital tool usage and natural resource management.



Demographic Renewal: Strengthening the role of young farmers, new entrepreneurs, and women in agriculture.



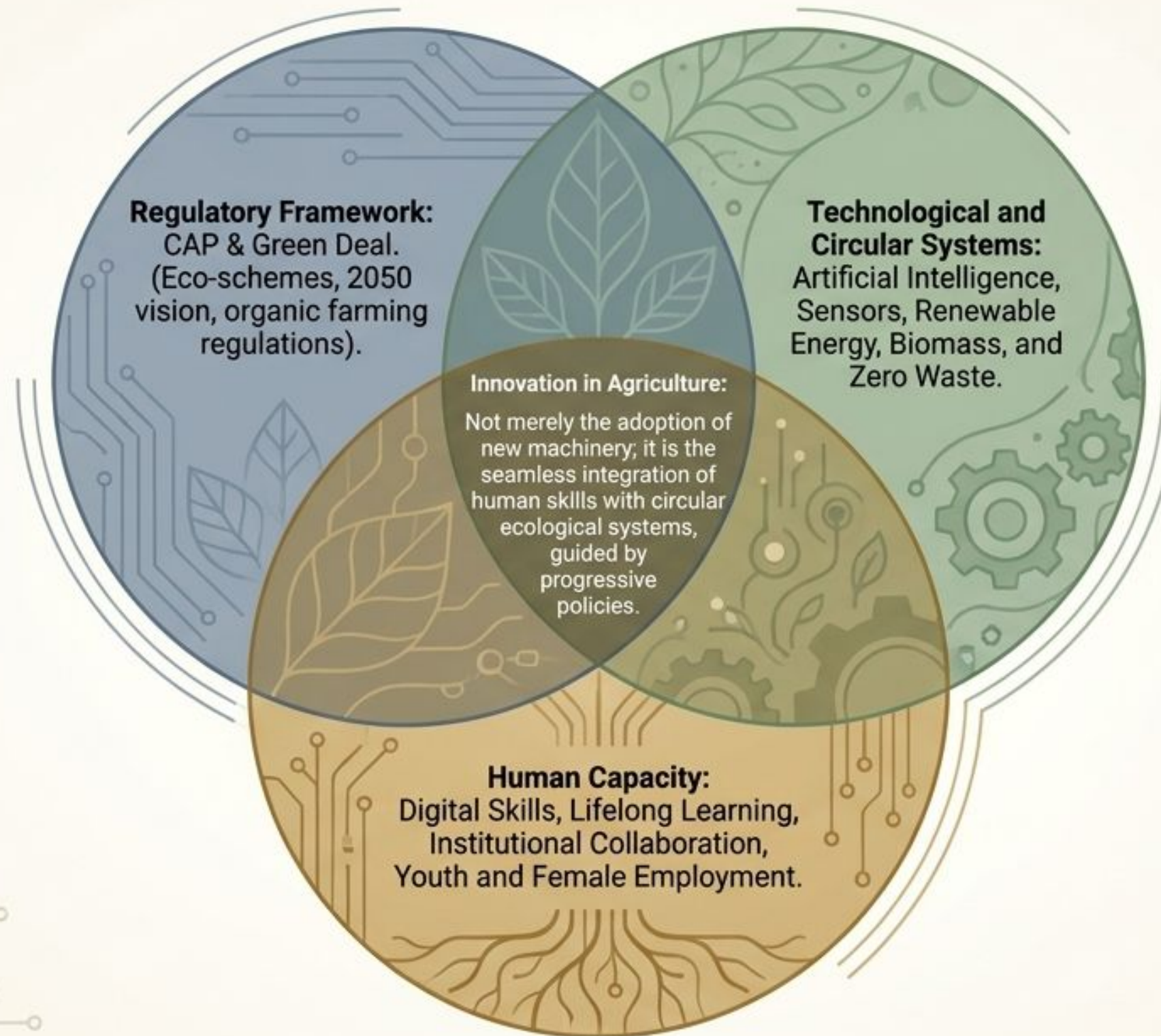
Lifelong Learning: Continuous vocational training and agricultural advisory services in rural areas.



Cross-Border Collaboration: Exchange of good practices and knowledge between countries/regions through European programs like Erasmus+.



Synthesis: The True Definition of Agricultural Innovation



Project vision: A successful transition is only possible through the harmony of knowledge, technology, and nature.



INNOVATION IN AGRICULTURE