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# Agroforestry - ecological restoration and climate change mitigation

**Robert Borek**

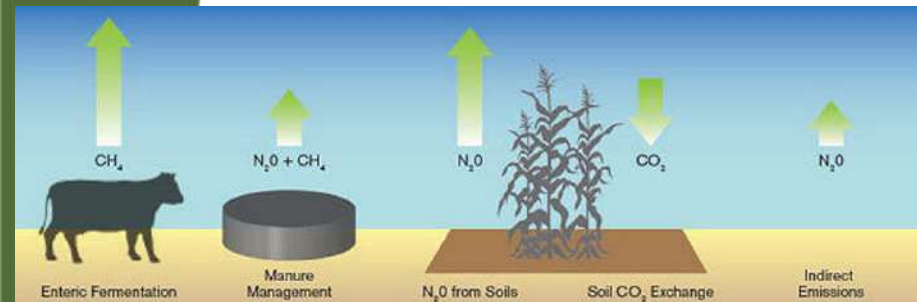
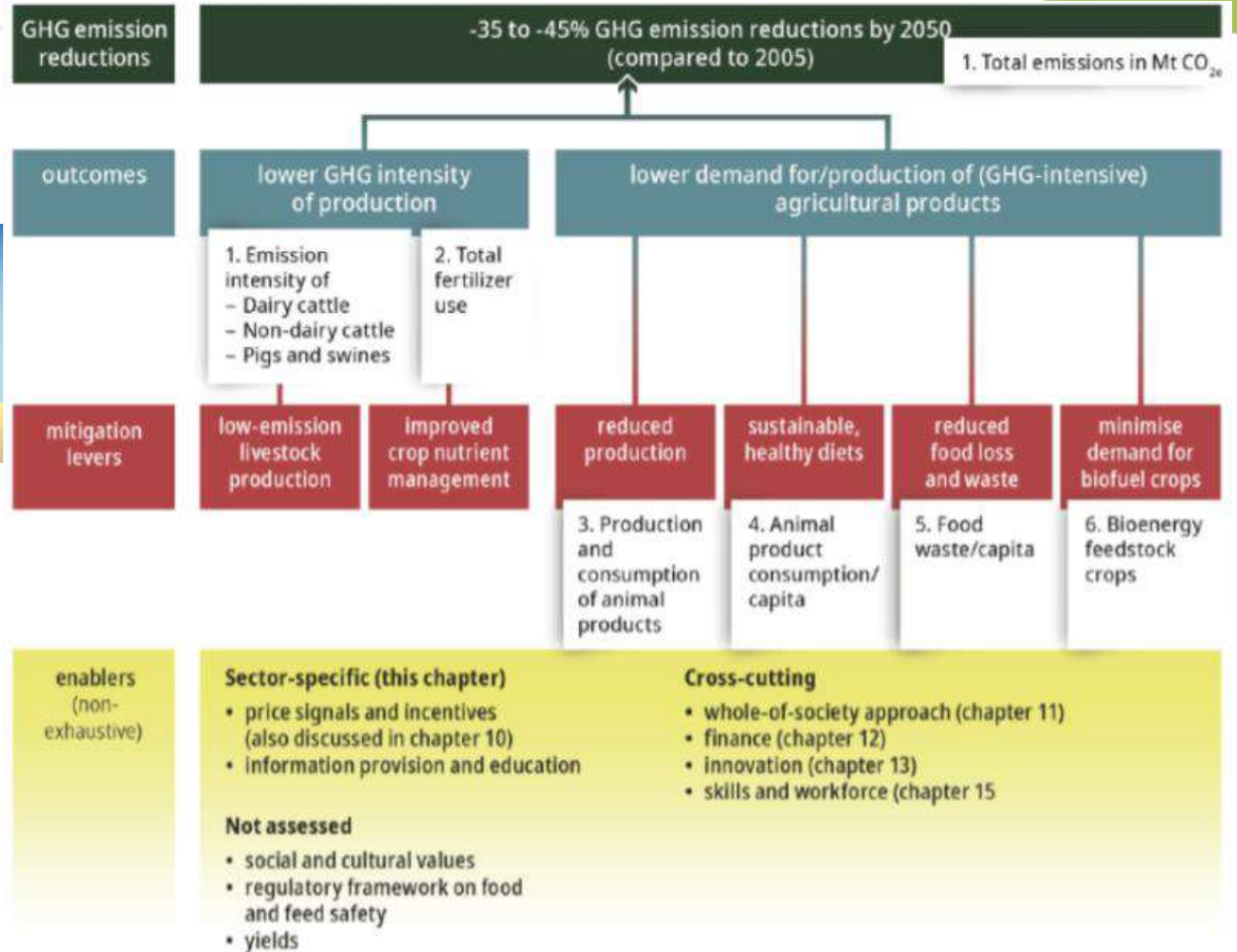


Institute of Soil Science  
and Plant Cultivation  
State Research Institute





# Climate change reduction commitments



Source: European Scientific Advisory Board on Climate Change (ESABCC); capreform.eu

Source: Advisory Board (2024)

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# Rural sociologist: Farmer protests a reaction to 'the crisis of globalised agriculture'



The turmoil and confusion



## Greens call for tax on windfall food profits to support farmers

By Maria Simon Arboleas | EURACTIV | Est. 4min | 5 lut 2024 (updated: 6 lut 2024)

Content-Type: News

## Germany's Habeck wants market power of food industry scrutinised



HOME > LATEST FROM EU MEMBER STATES > "Established democratic parties ignored problems of farmers for far too long" | PROTEST

## 'Established democratic parties ignored problems of farmers for far too long'

January 31, 2024 | Hannes Lorenzen | Latest from EU Member States, Main stories

PRESS RELEASE | 31 January 2024 | Brussels

## Commission proposes to allow EU farmers to derogate for one year from certain agricultural rules

## EU Commission chief to withdraw the contested pesticide regulation

By Olivia Gyapong | EURACTIV | Est. 4min | 6 lut 2024 (updated: 7 lut 2024)

Content-Type: News



## EU Commission proposes package to defuse farmers' anger



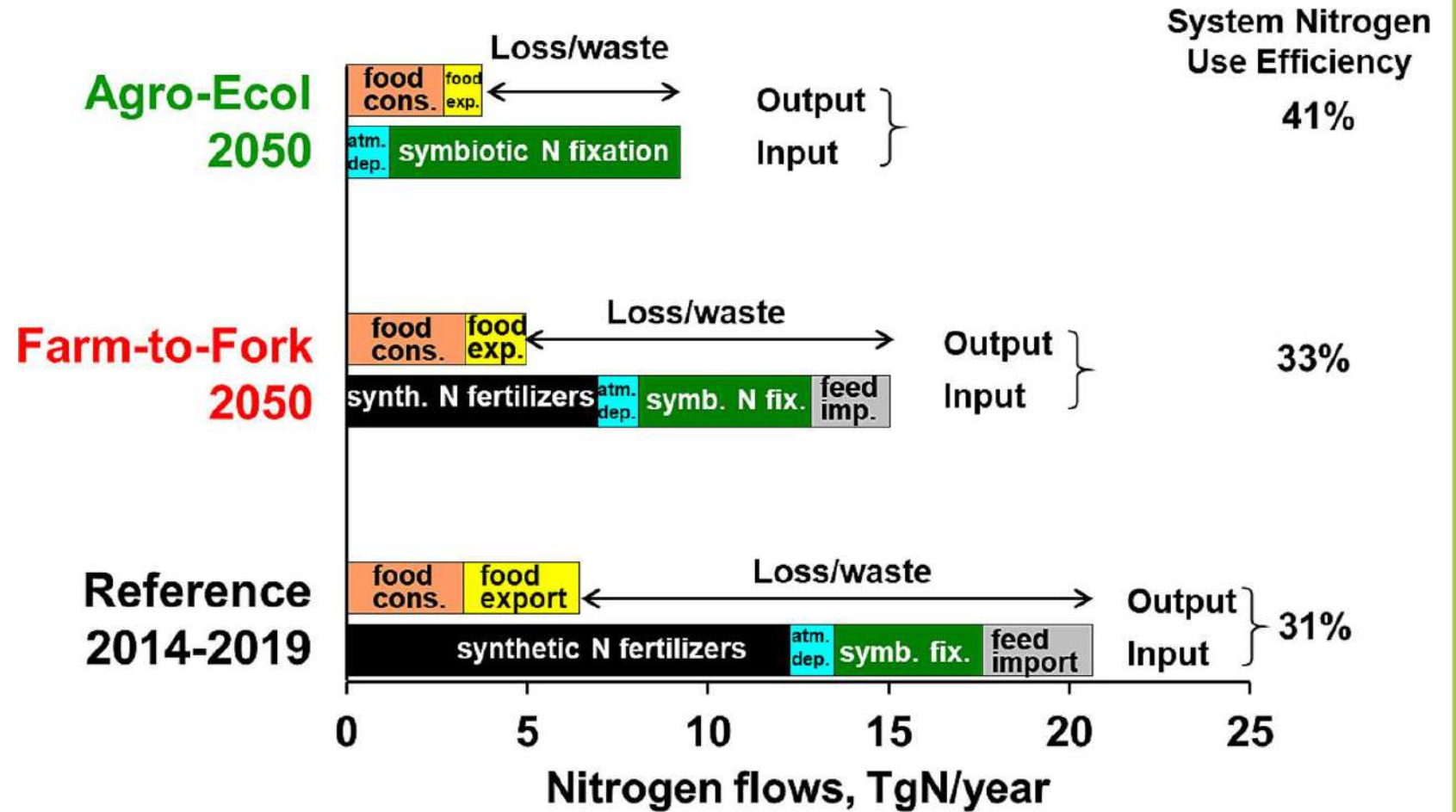
Reklamy Google

Nie wyświetlaj tej reklamy

Dlaczego ta reklama? ↗

# Ukraine seeks action against Polish farmers for grain spillage

## Scenarios European agri-food system



Source: Billen et al. 2023



Biodiversity is fundament of life



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BRIEFING

## Rethinking agriculture

While global food chains, market competition, industrial processes and increasing productivity have turned agriculture into a profitable economic sector, it is also one of the biggest contributors to environmental and sustainability challenges in Europe and worldwide. In tandem, the COVID-19 pandemic, recent geopolitical developments in Europe and socio-economic trends have driven attention towards agriculture and food systems. Considering these new challenges, it is even more urgent to rethink agriculture and food systems to make them resilient and sustainable. This briefing reflects on what makes agriculture unsustainable today — and the types of agriculture we may want to preserve and support.



## Towards a circular economy that begins and ends in nature

Barbara Pia Oberč, Roza de Jong, Tommaso Demozzi,  
Barbara Battioni Romanelli

Alberto Arroyo Schnell, editor

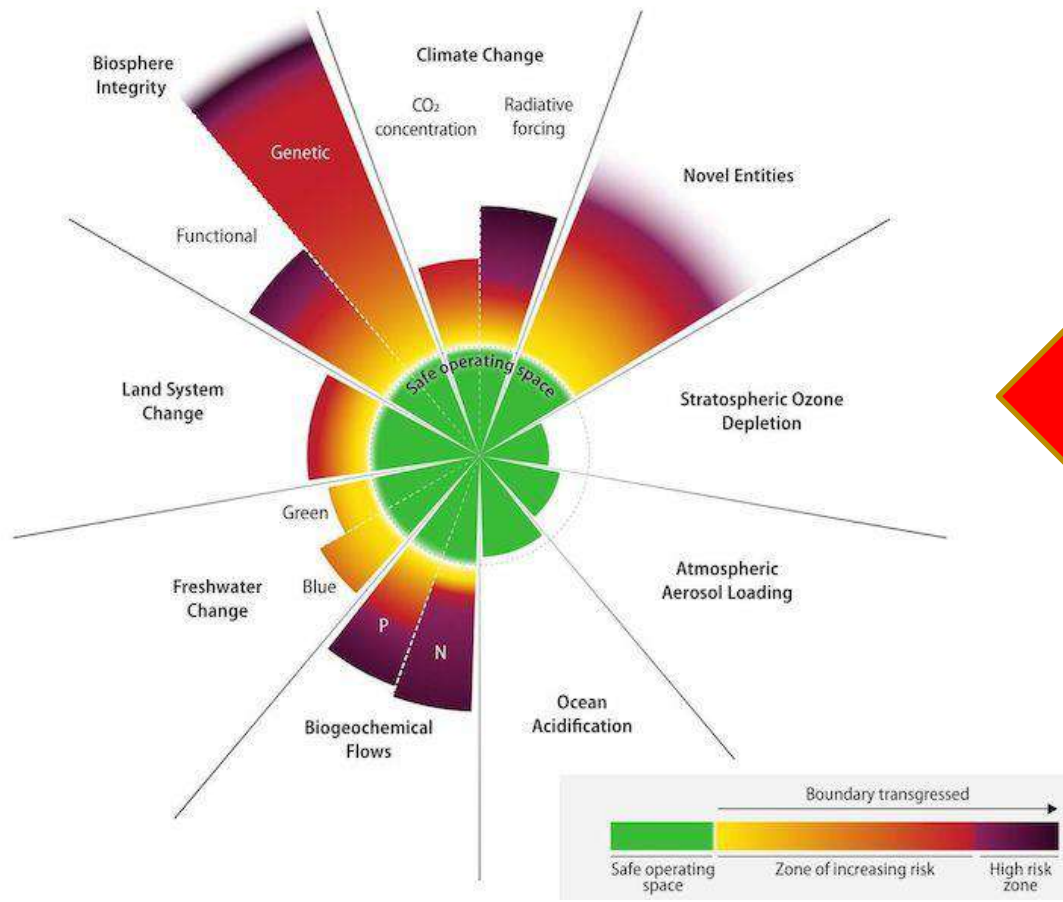


INTERNATIONAL UNION FOR CONSERVATION OF NATURE

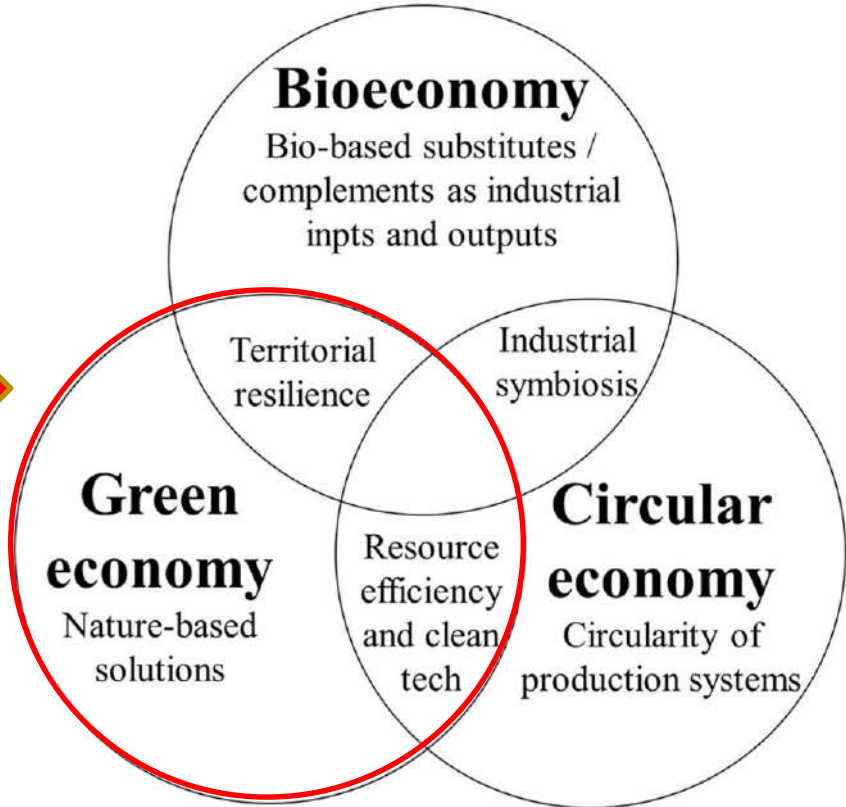
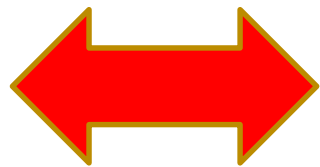
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## Approaching existential danger zone?



Richardson et al.. 2023

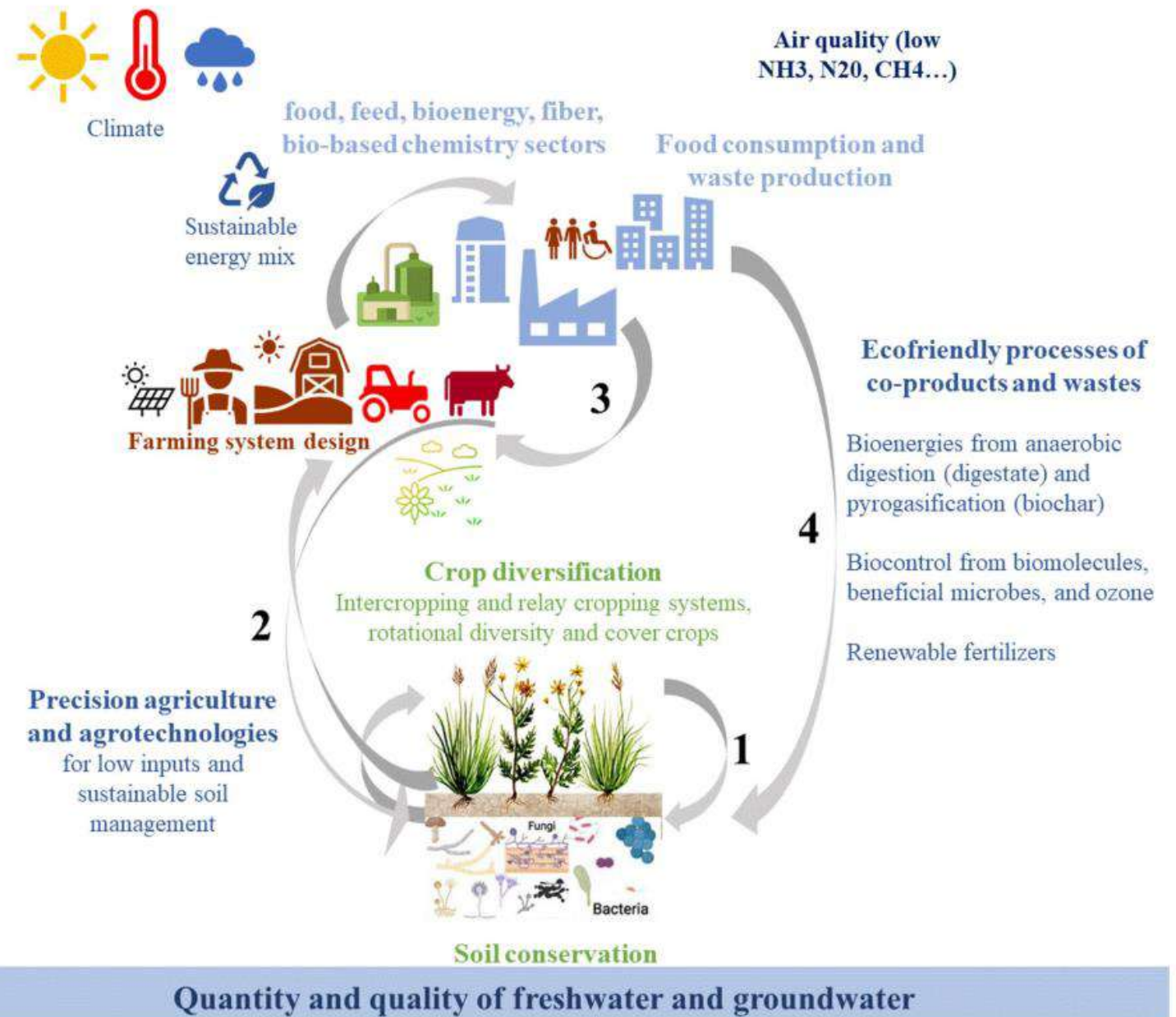


D'Amato et al. 2019



## Agricultural transformation pathway

**Combining agroecology and bioeconomy to meet the societal challenges of agriculture**  
 Faucon et al., Plant Soil (2023)

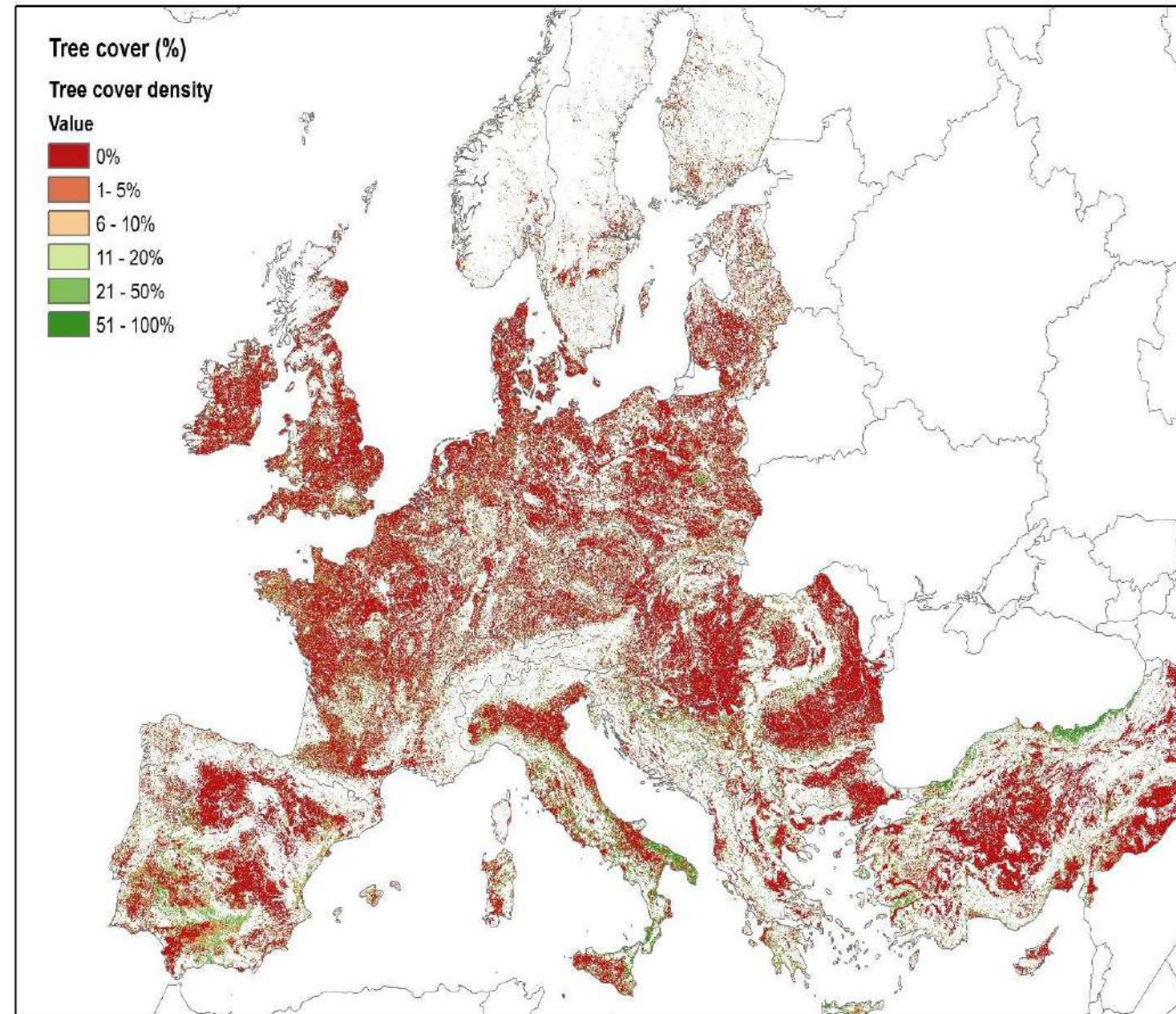


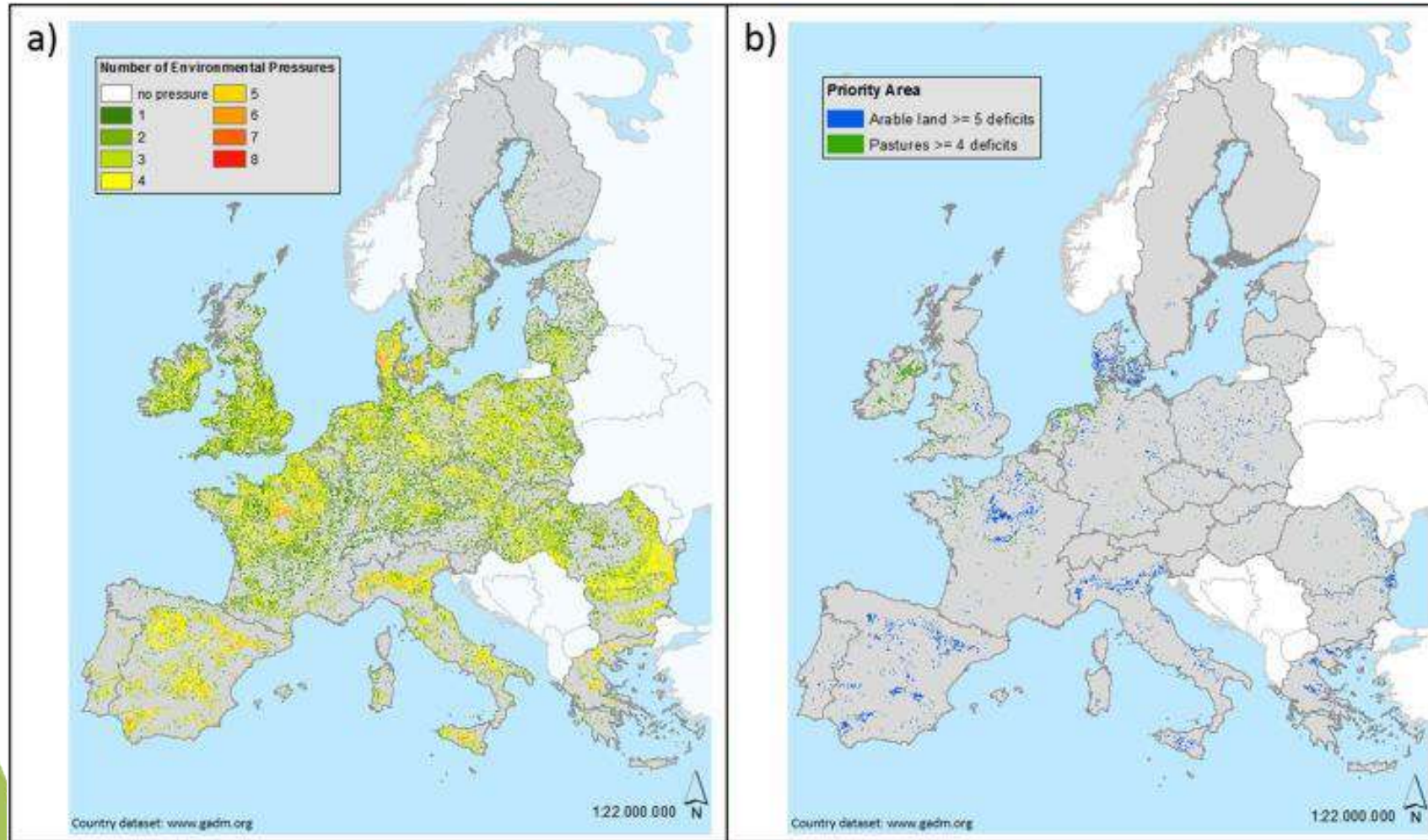
*“Land use system in which trees are grown in combination with agriculture on the same land”*  
(EC Regulation 1305/2013)

*“Agroforestry practices include all forms of association of trees and crops (silvoarable systems) and/or animals (silvopastoral systems), on a parcel of agricultural land, whether in the interior of the parcel or on its edges (hedges)”* (European Agroforestry Federation)

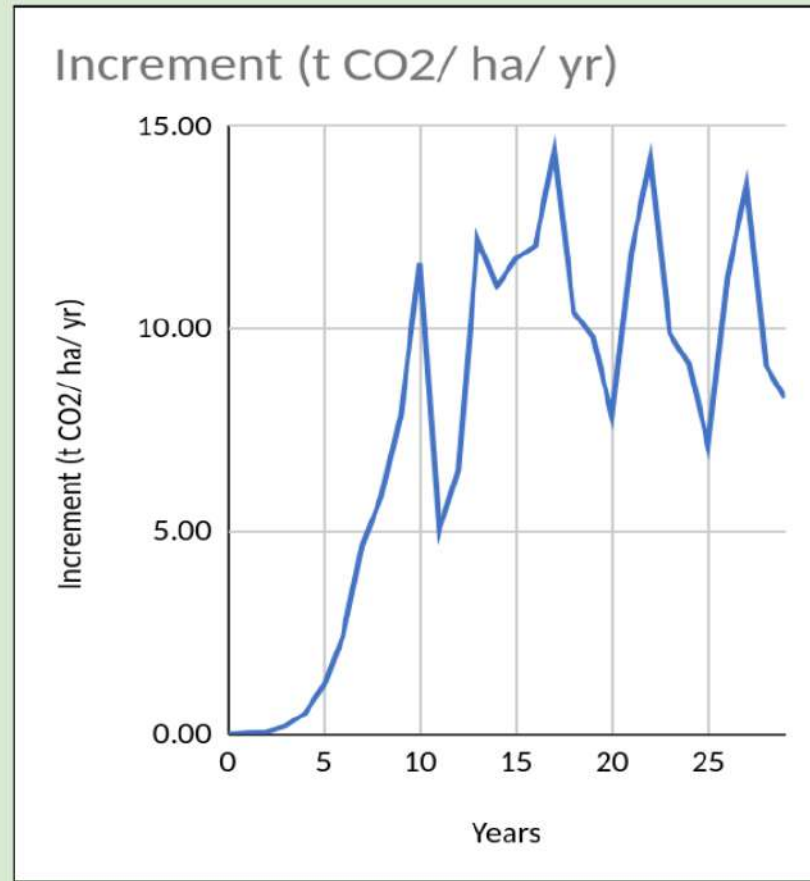
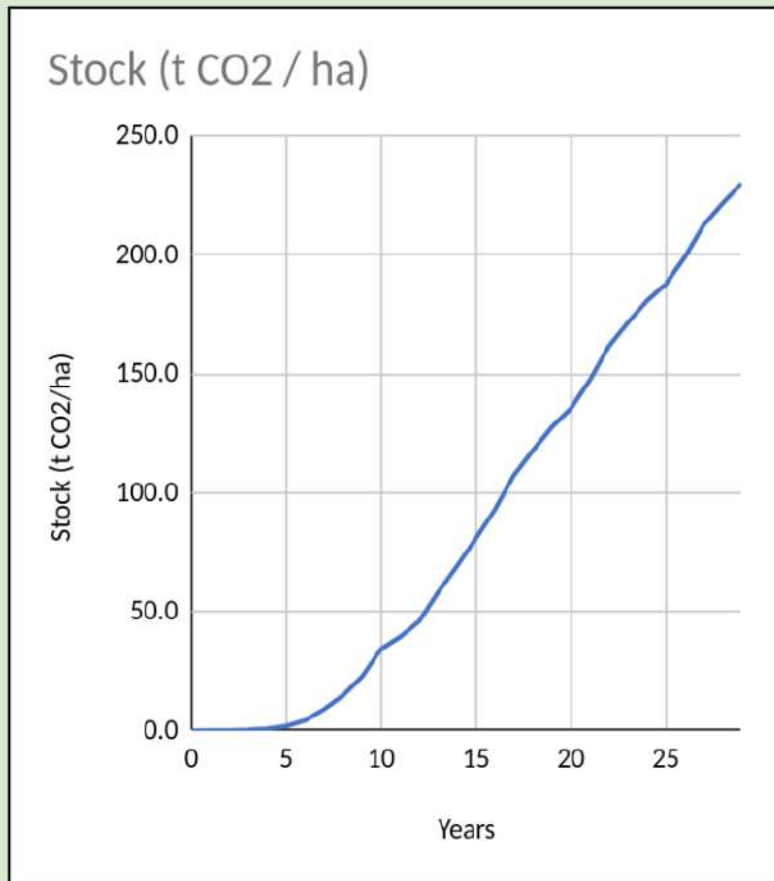


**Focus new planting  
on “tree deserts”**





The EU's most degraded agricultural lands alone could host **3.13 billion trees** as part of restoration



1 million ha from 2025 until 2050 at 150 poplar trees/ha, 30 years giving in total 81 MT in 2030 and **192 MT CO<sub>2</sub> yr<sup>-1</sup> in 2050**



# Productivity (biomass + agricultural crops)

France



Italy



Hungary



UK



Germany



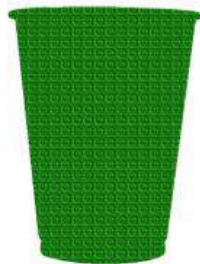
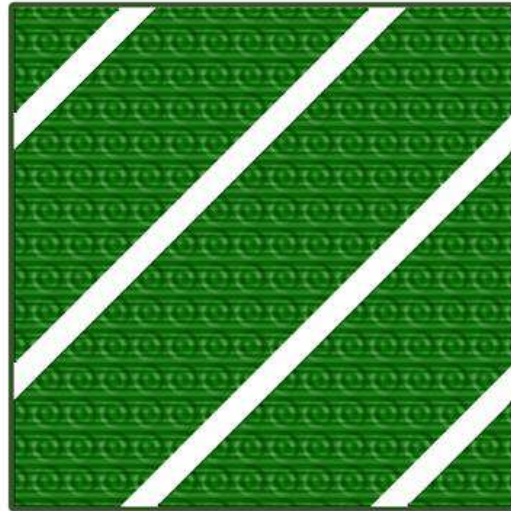
Czechia



## Productivity improvement

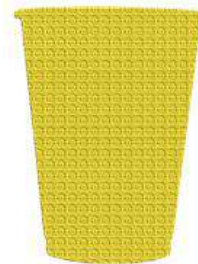
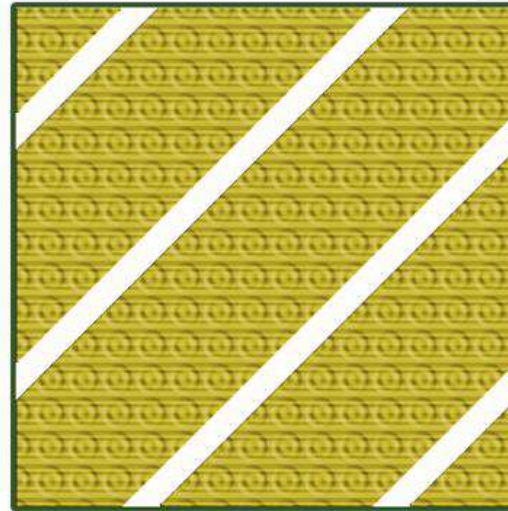
$$\text{Land Equivalent Ratio} = \frac{\text{Intercrop yield of crop A}}{\text{Sole crop yield of A}} + \frac{\text{Intercrop yield of crop B}}{\text{Sole crop yield of B}}$$

SRC willow (1 ha)



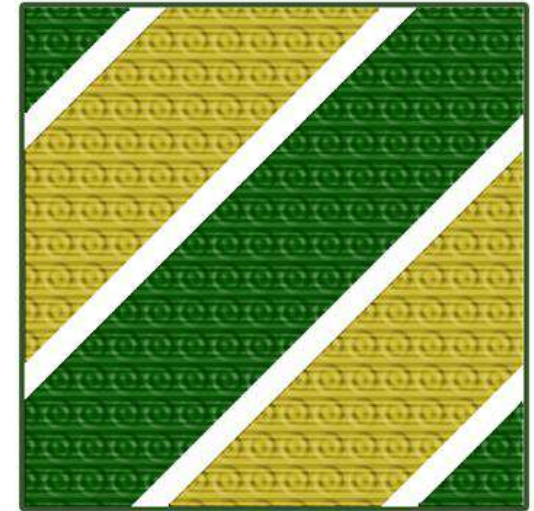
100% target yield of wood

Barley (1 ha)



100% target yield of barley

SRC willow and barley (1 ha) – 1.2

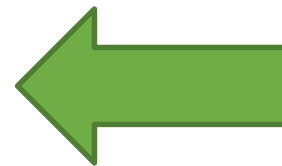


40% target yield of wood



80% target yield of barley

Part of the plant	Possible uses of the hazel plant and its by-product
<b>Whole plant</b>	Soil protection Truffles Ornamental value
<b>Shells</b>	Activated carbon Probiotics Packaging Cosmetic, pharmaceutical and food products Thermal insulating material Biomass for energy production
<b>Skins</b>	Roasted skin extracts Phenolic compounds
<b>Husks</b>	Biofuel and biogas Insulating material Medium density panels
<b>Leaves</b>	Astringent, vaso-protective and anti-oedema infusions Antioxidant and antimicrobial extracts Phenolic compounds Organic fertilizer
<b>Prunings</b>	Rural crafts Walking sticks Biochar and syngas

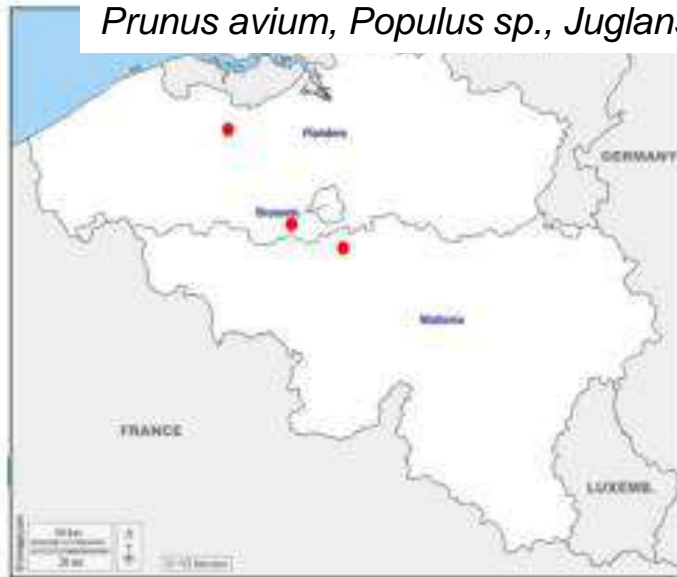


Allegrini et al. 2022

## Integration of agroforestry functions is context-specific



*Prunus avium, Populus sp., Juglans regia, Sorbus torminalis*



*Populus sp.*



18 varieties of *Juglans regia*



*Populus sp.* + *Quercus petraea*  
In the depth: *Malus domestica* + *Sorbus torminalis* and *S. domestica*



Multispecies hedgerows

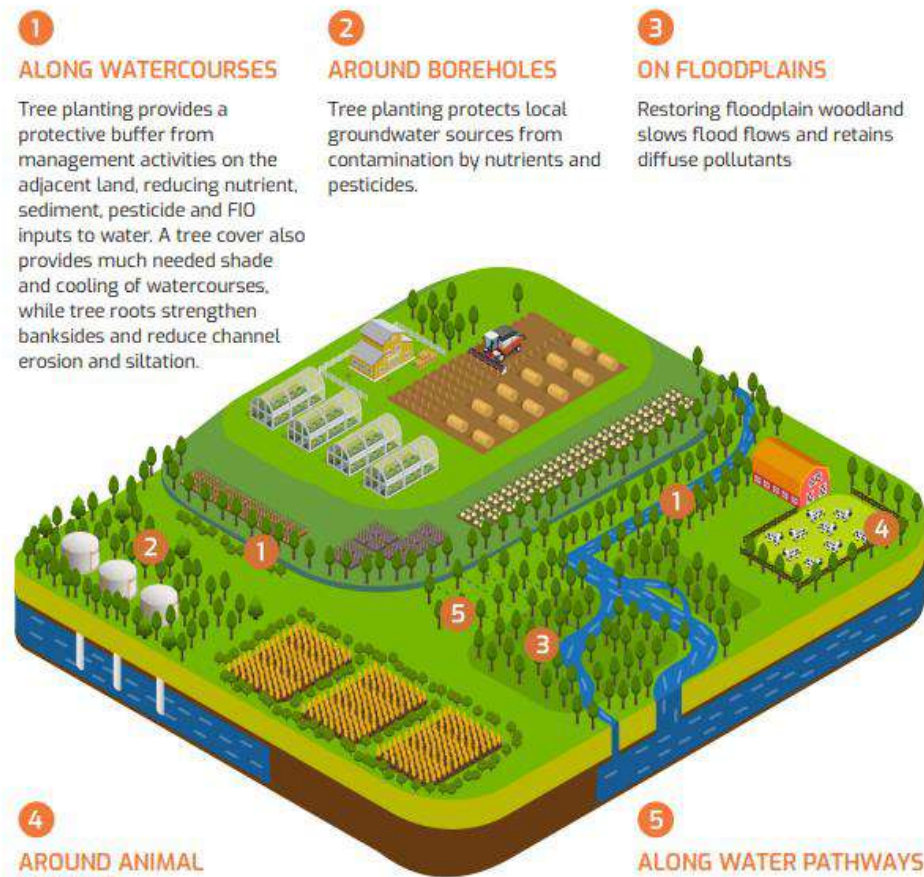


- 1 NUTRIENTS**  
Wash-off and leaching of nitrate and phosphate from fertiliser and manure applications.
- 2 SEDIMENT**  
Soil disturbance and sediment runoff due to land management practices and stock grazing.
- 3 PESTICIDES**  
Aerial drift, wash-off or leaching of pesticides following applications.
- 4 FAECAL INDICATOR ORGANISMS**  
Runoff of faecal bacteria from animal manure and slurry applications.

Figure 1  
Catchment sources and pathways of agricultural diffuse pollution impacting on the water environment and water users

	Permanent Grassland	Rough Pasture	Wheat	Barley	Maize	Oil Seed Rape	Woodland
Nitrogen Input (kg/ha/yr)	94-135	10	131-167	120-132	46-62	155-189	20
Nitrate-N Export (kg/ha/yr)	0.86-10.58	0.02-0.05	1.54-19.72	1.54-19.72	1.52-19.72	3.29-17.4	0.02-0.1
Phosphate Input (kg/ha/yr)	6-16	0	13-35	18-41	27-43	15-37	0
Phosphate Export (kg/ha/yr)	0.012-0.169	0.008	0.038-0.458	0.038-0.458	0.038-0.458	0.15-1.834	0.008

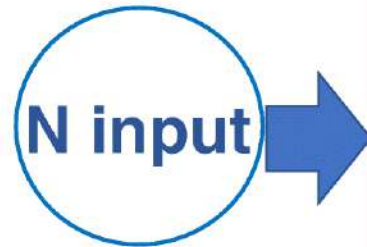
Table 1  
Nutrient loads and modelled export coefficients to water for different crops vs woodland in Great Britain. Nutrient loads taken from the British Survey of Fertiliser Practice for 2000-2011 (BSFP, 2013) and export coefficients based on the same data modelled for the UK National Ecosystem Assessment Follow-on Report (Bateman et al., 2014).



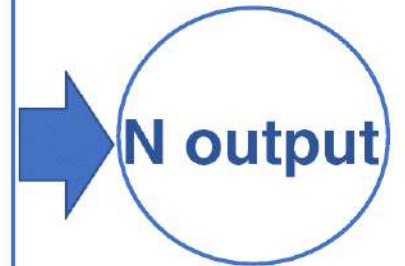
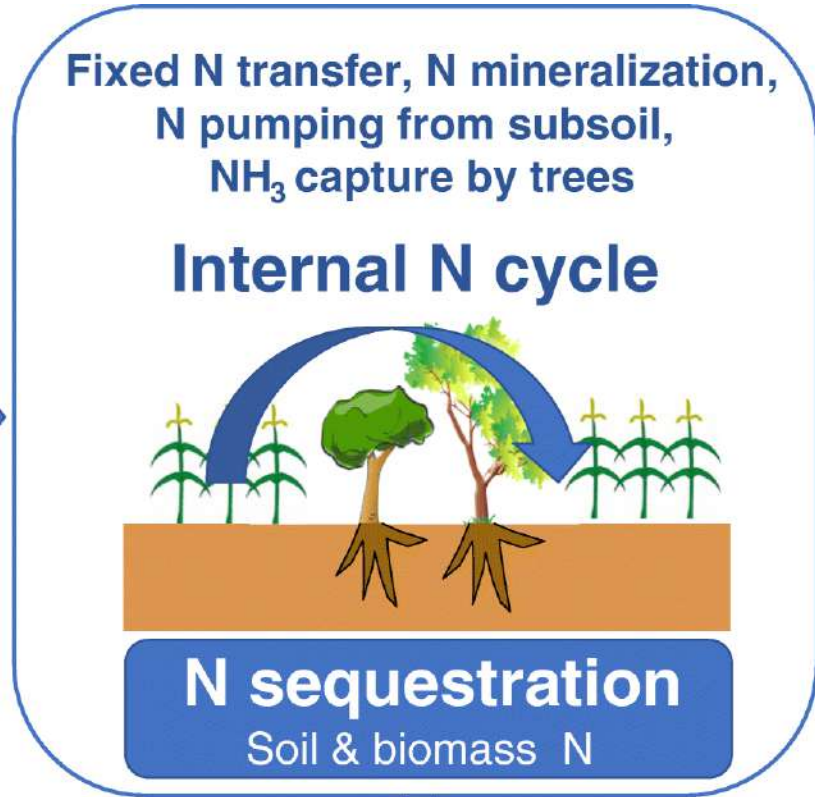
- 1 ALONG WATERCOURSES**  
Tree planting provides a protective buffer from management activities on the adjacent land, reducing nutrient, sediment, pesticide and FIO inputs to water. A tree cover also provides much needed shade and cooling of watercourses, while tree roots strengthen banksides and reduce channel erosion and siltation.
- 2 AROUND BOREHOLES**  
Tree planting protects local groundwater sources from contamination by nutrients and pesticides.
- 3 ON FLOODPLAINS**  
Restoring floodplain woodland slows flood flows and retains diffuse pollutants.

- 4 AROUND ANIMAL HOUSING**  
Tree planting around animal housing captures ammonia and improves air quality.
- 5 ALONG WATER PATHWAYS**  
Tree planting along and across water pathways increases infiltration of runoff and pollutant retention.

Figure 2  
Preferred locations in a farmed landscape for tree planting to reduce diffuse pollution



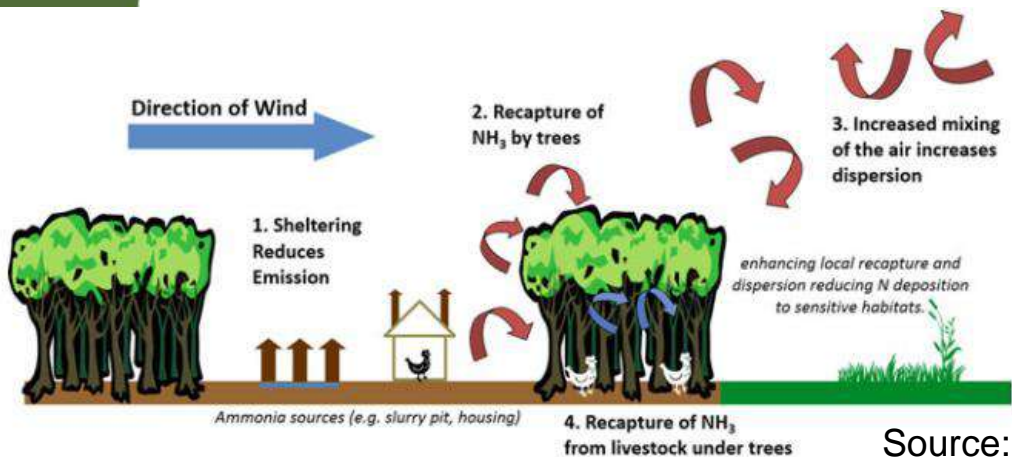
**N<sub>2</sub> fixation,  
organic amendment,  
inorganic fertilizer,  
N deposition**



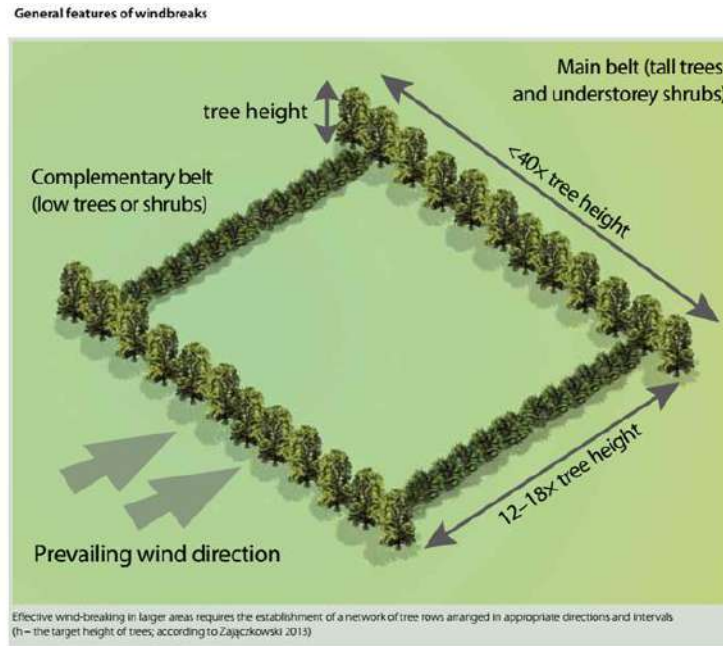
**N in harvested  
crop & timber**

**N loss**  
Soil erosion,  
runoff, leaching,  
gaseous N emissions

Capturing NH<sub>3</sub> emissions by trees



Source: Kim & Isaac, 2022





- Intercropping in an oak agroforestry system in Kea island (Aegean sea)
- Valonia oak + Barley (*Hordeum vulgare*) as animal feed

A traditional practice where acorn cups are used for tannery, the acorns and the annual crop production as animal feed and the trees conserve the soil from erosion (stabilise the terraces)

Wind and heat protection; improving reproduction and meat/eggs/milk quality; health



Species	Organic matter digestibility (%)	Dry protein content (%)	Macronutrients (g/kg DM)*
<b>Alnus glutinosa</b>	48.1	19.2	6-17 Ca; 3-9 K
<b>Corylus avellana</b>	47.7	16.1	11-19 Ca; 5-27 K
<b>Fagus sylvatica</b>	30.7	18.0	13-22 Ca; 2-21 K
<b>Fraxinus excelsior</b>	34.1	15.7	5-40 ; 2-29 K
<b>Robinia pseudoacacia</b>	56.7	20.4	-
<b>Salix spp.</b>	57.8	15.9	5-31 Ca; 2-26 K
<b>Tilia platyphyllos</b>	30.6	21.4	14-24 Ca; 6-26 K
<b>Lolium pratense</b>	<b>79.0</b>	<b>16.5</b>	<b>6 Ca; 37 K</b>

**Additional fodder/  
Supplementation of  
nutritional needs**

Source:  
<http://www.voederbomen.nl/nutritionalvalues>  
Luske B.; van Eekeren N., 2016.



## Policy Briefings

Agroforestry Policy Briefings? Why?

1. Agroforestry and the new CAP's Green Architecture
2. Agroforestry in the EU Forest Strategy
3. Agroforestry and CAP Direct Payments
4. Agroforestry and Enhanced Conditionality
5. Agroforestry and Ecoschemes
6. Agroforestry and Pillar II of the new CAP
7. Agroforestry CAP Monitoring
8. Agroforestry for Carbon Farming
9. AF Policy in England
10. EURAF reacts to the Commission's advice on CAP SPs
11. EU Agroforestry Policy for a North American Audience
12. EURAF reacts to the EU "Fit for 55 Package"
13. EURAF welcomes the "EU Soil Strategy for 2030"
14. Agroforestry in the CAP post



# European Agroforestry Federation

Join Us

- Represents agroforestry associations from more than 20 European countries
- Promotes the use of trees on farms throughout Europe
- Collaborates with academia, policymakers and EU stakeholders

<https://euraf.net>

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