

Co-benefits of the CRCF

Gerry Lawson (European Agroforestry Federation) and [EU DigitAF Project](#)

Second Conference on Earth Observation for
Monitoring Reporting and Verification of
Carbon Removals and Third Carbon Markets
Forum
[Copenhagen 7-10 2025](#)

policy@euraf.net

CRCF (2024/3012) Co-benefits.

These repeat the six environmental objectives of the Sustainable Finance Taxonomy (2020/852)

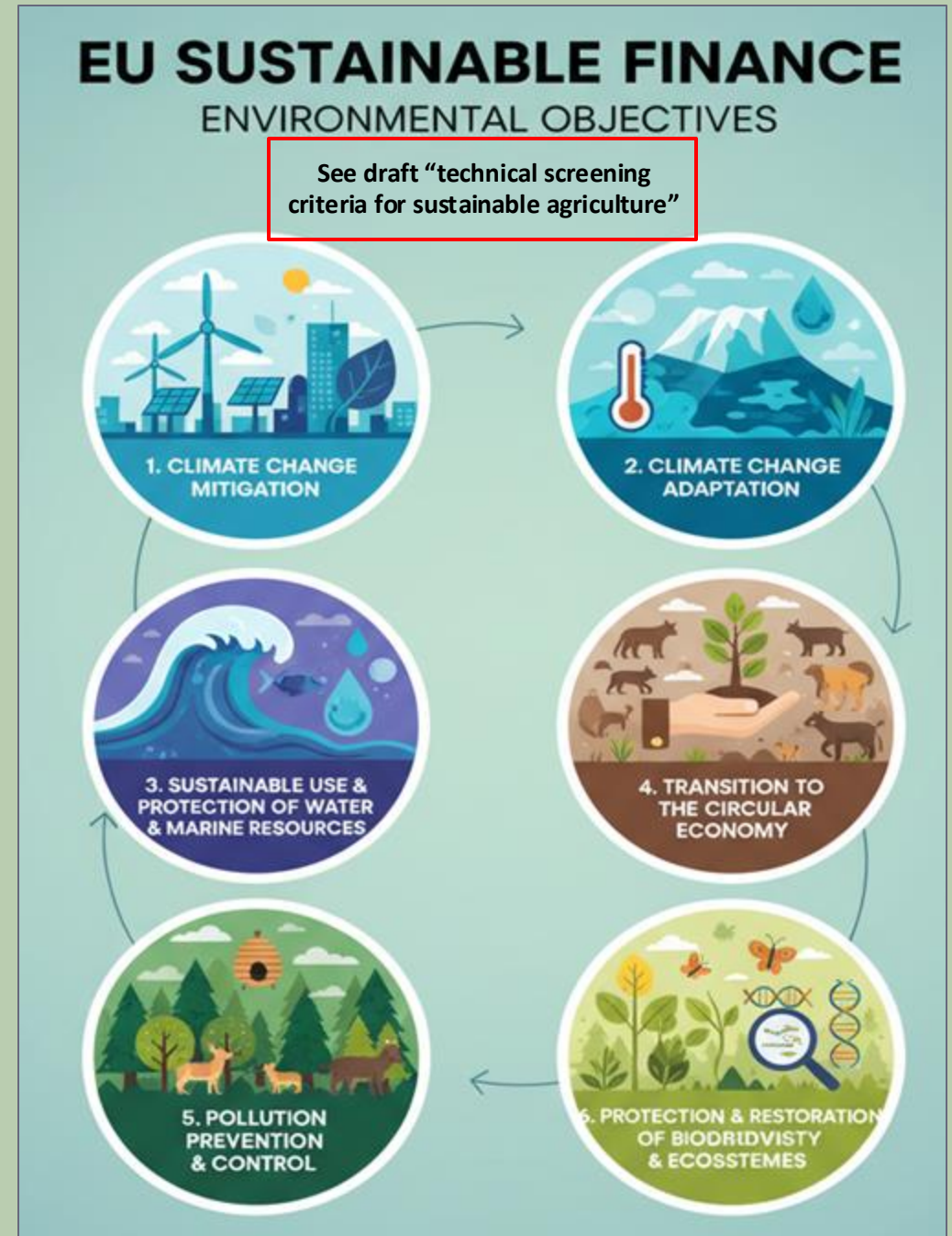
Article 7 (Sustainability (Do No Significant Harm))

An activity shall do no significant harm to the environment and may generate co-benefits for one or more of the following sustainability objectives

- A. *climate change mitigation beyond the net carbon removal benefit and net soil emission reduction benefit referred to in Article 4(1) and (2);*
- B. *climate change adaptation;*
- C. *the sustainable use and protection of water and marine resources;*
- D. *transition to a circular economy, including the efficient use of sustainably sourced bio-based materials;*
- E. *pollution prevention and control;*
- F. *protection and restoration of biodiversity and ecosystems, including soil health as well as avoidance of land degradation.*

Article 8 (Certification Methodologies) .. shall ..

- B. promote the protection and restoration of biodiversity and ecosystems;





How to measure the “protection and restoration of biodiversity and ecosystems”?

66. Agroforestry for carbon farming certification: how to demonstrate co-benefits for biodiversity and ecosystems?

EURAF Policy Briefing 66. 28.2.25, DOI 10.5281/zenodo.14917786

Gerry Lawson, Amayes Kara (EURAF), Sonja Kay (Agroscope), Jari Vandendriessche (Ghent University), Jo Smith (MVARC), Tomaz Gorenc, Urška Kranjc (IHE)

EURAF is based in Montpellier, Brussels & Toledo (Transparency Register ID of 913270437706-52). It aims "to promote the adoption of agroforestry practices across Europe and support awareness, education, research, policy and investments which foster the use of trees on farms". It has a network of 31 affiliated entities in 23 countries. Other EURAF Policy Briefings are listed [here](#). Contact: policy@euraf.net

Abstract

Policy Briefing 66 (v1) describes the clear benefits which agroforestry systems have for biodiversity and the protection of ecosystems. But how can these be demonstrated in carbon farming projects, without a monitoring complexity and timescale which makes the projects uneconomic? Biodiversity was the only one of the six "sustainability" elements recognised in the European Sustainable Finance Taxonomy which co-legislators of the Carbon Removals and Carbon Farming Certification Framework insisted must show a clear co-benefit. For the other five areas (mitigation, adaptation, water resources, pollution and the circular economy) it is sufficient that projects should "do no significant harm". Several potential indicators of biodiversity and ecosystem health are suggested for inclusion in the Carbon Farming Delegated Act of the CRCF, due to be published in summer 2025. We also propose a structure for an Agroforestry Carbon Farming Management Plan which sets out the activities and potential monitoring steps to be undertaken in agroforestry carbon farming projects.



- Step 1:** use the indicators proposed in the CRCF “draft methodology”
- Step 2:** add indicators and practices from the Nature Restoration Regulation
- Step 3:** use the existing CAP Agri Environmental Indicators (AEIs)
- Step 4:** add farm and parcel scale to the existing CAP AEI Indicators
- Step 5:** link to parcel-scale calculation of LULUCF/AFOLU emissions
- Step 6:** add modern biodiversity monitoring to the CAP AEIs.
- Step 7:** quantify the co-benefits of nature based solutions like agroforestry



Policy brief

Ensuring carbon farming delivers sustainability benefits

Recommendations for carbon farming certification methodologies

Project CREDIBLE: “Building momentum and trust to achieve credible soil carbon farming in the EU”.

Funded by the European Union under the Grant Agreement n° 101112951.

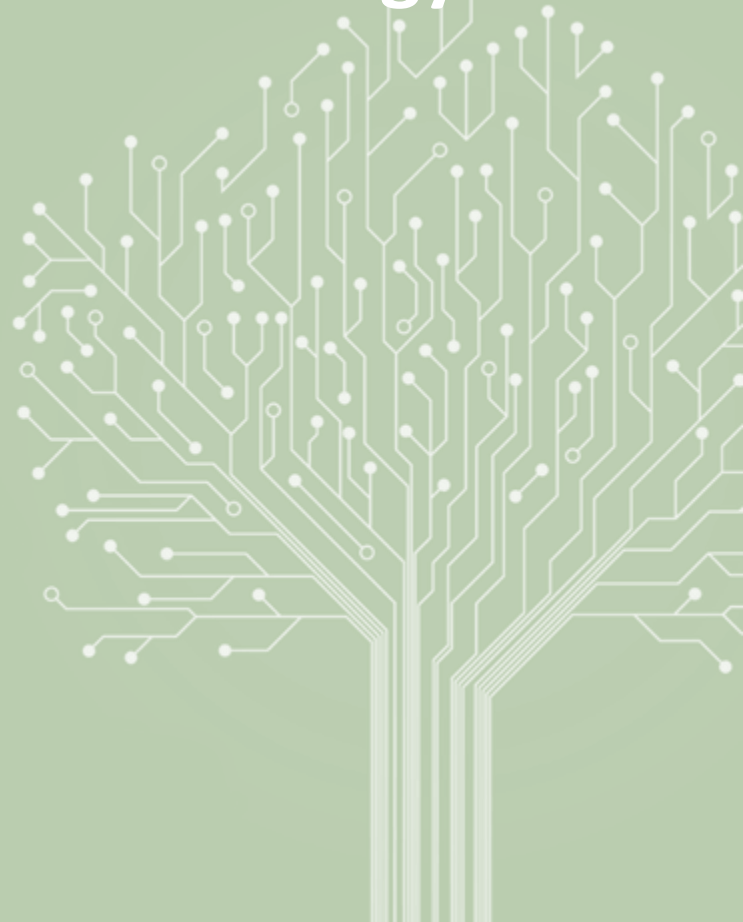
www.project-credible.eu





Step 1 - Use the flexibility in the draft CRCF “methodology”

The latest draft CRFC “methodologies” for “agriculture and agroforestry” ([link](#)); “afforestation” ([link](#)) and peatland rewetting ([link](#)) leave the co-benefit indicators open - see [EURAF Policy Briefing #20](#)





STEP 1 - Indicators proposed in the CRCF draft methodology

Promoting the protection and restoration of biodiversity and ecosystems:

1. The activity has been demonstrated in peer-reviewed scientific literature to have **beneficial impacts for biodiversity protection or restoration**.
2. The activity corresponds to at **least one of the measures in the NRR “typology of measures”** (*NRR Annex VII*) and is consistent with restoration within the meaning of Article 3(3) of the NRR and with the relevant national restoration plan.
3. The activity is qualitatively demonstrated to contribute to improved condition or maintain good condition of a habitat type or a habitat of species of Union interest, using established methodologies such as those under the **Habitats and Birds Directive**, or the EU-wide methodology on **mapping and assessing ecosystem condition for other ecosystems**;
4. In the case of agroforestry, the activity aligns with the recommendations for designing and managing agroforestry systems included in the **EU Guidelines on biodiversity friendly afforestation, reforestation and tree planting**.



Step 2 - Use indicators and practices from the EU Nature Restoration Regulation

See [EURAF Policy Briefing #18](#) “*Agroforestry and the EU Nature Restoration Regulation*”



STEP 2: Indicators and Practices in the Nature Restoration Regulation (2024/1991)

Trends shall be measured in the period from 18 August 2024 until 31 December 2030, and every six years thereafter, until “satisfactory” levels are reached

Agriculture (Article 11 & Annex IV) , MS choose two from three of ..

- **Grassland butterfly index** (*species considered to be characteristic of European grasslands and which occur in a large part of Europe, covered by the majority of the Butterfly Monitoring Schemes - based on the geometric mean of species trends*)
- **Stock of organic carbon in cropland mineral soils** (*tonnes organic carbon/ha - in cropland mineral soils to a depth of 30 cm*)
- **Share of agricultural land with high-diversity landscape features** (*buffer strips, hedgerows, individual or groups of trees, tree rows, field margins, patches, ditches, streams, small wetlands, terraces, cairns, stonewalls, small ponds and cultural features, are elements of permanent natural or semi-natural vegetation present in an agricultural context which provide ecosystem services and support for biodiversity). But excludes “productive trees” unless in “sustainable agroforestry systems” and excludes most types of productive agricultural use - e.g. grazing or slurry spreading*)

STEP 2: Indicators and Practices in the Nature Restoration Regulation (2024/1991)

Trends shall be measured in the period from 18 August 2024 until 31 December 2030, and every six years thereafter, until “satisfactory” levels are reached.

Forestry (Article 12 & Annex VI) - MS must choose 7 of 8

1. **Standing deadwood*** (*non-living standing woody biomass m³/ha*)
2. **Lying deadwood*** (*m³/ha non-living woody biomass lying on the ground*)
3. **Share of forests with uneven-aged structure** (*% of forests available for wood supply*)
4. **Forest connectivity*** (*index (0-100) compactness of forest covered areas - index: 0 - 100*).
5. **Common forest birds index** (*index based on a specific list in each MS*)
6. **Stock of organic carbon** (*tCO₂/ha in litter and mineral soil to a depth of 30 cm*)
7. **Share of forest dominated by native tree species** (*% of total area with >50 % native tree species*)
8. **Tree species diversity** (*index - mean number of tree species in forest areas*)

Stars show indicators likely to worsen wildfires - and potential GHG emissions

STEP 2: Indicators and Practices in the Nature Restoration Regulation (2024/1991)

Potential nature restoration practices (Annex VII of the NRR)

- 1) Restore wetlands, by rewetting drained peatlands, removing peatland drainage structures or de-poldering and discontinuing peat excavation.**
- (2) Improve hydrological conditions by increasing quantity, quality and dynamics of surface waters and groundwater levels for natural and semi-natural ecosystems.**
- (3) Remove unwanted scrub encroachment or non-native plantations on grasslands, wetlands, forests and sparsely vegetated land.*
- (4) Apply paludiculture.**
- (5) Re-establish the meandering of rivers and reconnect artificially cut meanders or oxbow lakes.*
- (6) Remove longitudinal and lateral barriers, such as dikes and dams; give more space to river dynamics and restore free-flowing river stretches.*
- (7) Re-naturalise riverbeds and lakes and lowland watercourses by, for example, removing artificial bed fixation, optimising substrate composition, improving or developing habitat cover.*
- (8) Restore natural sedimentation processes.*
- (9) Establish riparian buffers, such as riparian forests, buffer strips, meadows or pastures.**
- (10) Increase ecological features in forests, such as large, old and dying trees (habitat trees) and amounts of lying and standing deadwood.*

STEP 3: Indicators and Practices in the Nature Restoration Regulation (2024/1991)

Potential restoration practices (Annex VII of the NRR)

(11) Work towards a diversified forest structure in terms of, for example, species composition and age, enable natural regeneration and succession of tree species.

(12) Assist migration of provenances and species where it may be needed due to climate change.

(13) Enhance forest diversity by restoring mosaics of non-forest habitats such as open patches of grassland or heathland, ponds or rocky areas.

(14) Make use of 'close-to-nature' or 'continuous cover' forestry approaches; introduce native tree species.

(15) Enhance the development of old-growth native forests and mature stands, for example, by abandonment of harvesting or by active management which favours development of autoregulatory functions and appropriate resilience.

(16) Introduce high-diversity landscape features in arable land and intensively used grassland, such as buffer strips, field margins with native flowers, hedgerows, trees, small forests, terrace walls, ponds, habitat corridors and stepping stones, etc.

(17) Increase the agricultural area subject to agro-ecological management approaches such as organic agriculture or agro-forestry, multi cropping and crop rotation, integrated pest and nutrient management.

(18) Reduce grazing intensity or mowing regimes on grasslands where relevant and re-establish extensive grazing with domestic livestock and extensive mowing regimes where they were abandoned.

(19) Stop or reduce the use of chemical pesticides as well as chemical and animal manure fertilisers.

(20) Stop ploughing grassland and introducing seeds of productive grasses

STEP 3: Indicators and Practices in the Nature Restoration Regulation (2024/1991)

Potential restoration practices (Annex VII of the NRR)

- (21) Remove plantations on former dynamic inland dune systems to re-enable natural wind dynamics in favour of open habitats.*
- (22) Improve connectivity across habitats to enable the development of populations of species, and to allow for sufficient individual or genetic exchange as well as for species' migration and adaptation to climate change.*
- (23) Allow ecosystems to develop their own natural dynamics for example by abandoning harvesting and promoting naturalness and wilderness.*
- (24) Remove and control invasive alien species, and prevent or minimise new introductions.*
- (25) Minimise negative impacts of fishing activities on the marine ecosystem, for example by using gear with less impact on seabed.*
- (26) Restore important fish spawning and nursery areas.*
- (27) Provide structures or substrates to encourage the return of marine life in support of the restoration of coral, oyster or boulder reefs.*
- (28) Restore seagrass meadows and kelp forests by actively stabilising the sea bottom, reducing and, where possible, eliminating pressures or by active propagation and planting.*
- (29) Restore or improve the state of characteristic native species population vital to the ecology of marine habitats by conducting passive or active restoration measures, for example, introducing juveniles.*
- (30) Reduce various forms of marine pollution, such as nutrient loading, noise pollution and plastic waste.*
- (31) Increase urban green spaces with ecological features, such as parks, trees and woodland patches, green roofs, wildflower grasslands, gardens, city horticulture, tree-lined streets, urban meadows and hedges, ponds and watercourses, taking into consideration, inter alia, species diversity, native species, local conditions and resilience to climate change.*
- (32) Stop, reduce or remediate pollution from pharmaceuticals, hazardous chemicals, urban and industrial wastewater, and other waste including litter and plastics as well as light in all ecosystems.*
- (33) Convert brownfield sites, former industrial areas and quarries into natural sites.***

Red = proven carbon sequestration effect; **Orange** = carbon sequestration effect uncertain



Step 3 - Use CAP Agri-Environmental Indicators

See [EURAF Policy Briefing #70](#) “Agroforestry and simplification of the CAP”



STEP 3: Use existing CAP Agri-Environment Indicators

See 2006 Guidelines “Development of agri-environmental indicators for monitoring the integration of environmental concerns in the CAP”

ANNEX

Proposal for a consolidated agri-environmental indicator set

DPSIR		No	Indicator	Level of development	Main limitations/improvement needed ¹ (X)			
Domain	Sub-domain				Conceptual improvement	Model improvement	Availability of regional data	Data quality ²
						S	O	
Responses	Public policy	1	Agri-environmental commitments	B				X
		2	Agricultural areas under Natura 2000	A				X
	Technology and skills	3	Farmers' training levels and use of environmental farm advisory services	A/B	X			X
	Market signals and attitudes	4	Area under organic farming	A				
Driving forces	Input use	5	Mineral fertiliser consumption	B			X	X
		6	Consumption of pesticides	C			X	X
		7	Irrigation	A				
		8	Energy use	B	X		X	X
	Land use	9	Land use change	B			X	
		10	Cropping/Livestock patterns	B	X			X
	Farm management	11	Farm management practices	B/C	X		X	X
	Trends	12	Intensification/extensification	A				X
		13	Specialisation	A				
		14	Risk of land abandonment	C	X	X		



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 15.9.2006
COM(2006) 508 final

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

Development of agri-environmental indicators for monitoring the integration of environmental concerns into the common agricultural policy

{SEC(2006) 1136}

Proposal for a consolidated agri-environmental indicator set (continued)

DPSIR		No	Indicator	Level of development	Main limitations/improvement needed ¹ (X)			
Domain	Sub-domain				Conceptual improvement	Model improvement	Availability of regional data	Data quality ²
						S	O	
Pressures and benefits	Pollution	15	Gross nitrogen balance	B			X	X
		16	Risk of pollution by phosphorus	New	X	X	X	X
		17	Pesticide risk	New	X	X	X	X
		18	Ammonia emissions	B		X	X	X
		19	Greenhouse gas emissions	A				X
	Resource depletion	20	Water abstraction	C			X	X
		21	Soil erosion	B	X	X		
		22	Genetic diversity	C	X		X	X
	Benefits	23	High nature value farmland	C	X			
24		Production of renewable energy	B	X		X	X	
State/impact	Biodiversity and habitats	25	Population trends of farmland birds	B			X	X
		Natural resources	26	Soil quality	C	X		X
	27.1		Water quality – Nitrate pollution	B			X	X
	27.2		Water quality – Pesticide pollution	B			X	X
	Landscape	28	Landscape – state and diversity	C	X	X	X	X

¹ More details on indicator description and measurements, and the improvements needed, are provided in Annex 2 of the Commission staff working document.
² Data sources that need improvement: S = statistical data sources (e.g. Farm Structure Survey), Farm Accountancy Data Network; O = other sources (e.g. administrative data; annual progress reports on the implementation of Rural Development Programmes).

STEP 3: Agri-Environment Indicators (1)

AEI	Class	Indicator Title	Comments	Data Holder	NUTS2	NUTS3
18	Air quality	Ammonia emissions	Tracks the total emissions of ammonia (NH ₃) from agriculture, primarily from livestock manure and the application of nitrogen fertilizers. Ammonia is a major air pollutant that contributes to acid rain and the formation of harmful particulate matter.	Eurostat/ EEA	✗	✗
2	Biodiversity	Agricultural areas under Natura 2000	Quantifies the percentage of Utilised Agricultural Area (UAA) that falls within Natura 2000 sites. These are protected areas designated under the EU's Birds and Habitats Directives. It shows the overlap between farming and areas of high conservation value, highlighting the role of farmers in managing these landscapes.	Eurostat	✓	✗
22	Biodiversity	Genetic diversity	Tracks the diversity of plant and animal genetic resources used in agriculture. It measures the number of livestock breeds and crop varieties being raised/grown and warns against the erosion of genetic diversity, which is crucial for food security and resilience to climate change.	Eurostat	✗	✗
23	Biodiversity	High Nature Value farmland	Identifies the extent of farmland characterized by low-intensity agriculture and a high level of biodiversity. These are often semi-natural habitats like species-rich meadows or traditional olive groves that are priorities for conservation.	Eurostat/ EEA	✓	✗
25	Biodiversity	Population trends of farmland birds	Tracks the population trends of common bird species that depend on agricultural habitats. A decline in the Farmland Bird Index signals a widespread degradation of the agri-ecosystem's health.	Eurostat/ EBCC	✗	✗
28	Biodiversity	Landscape - state and diversity (JRC)	Assesses the condition, extent, and diversity of semi-natural landscape features within agricultural areas. Includes woody features (hedgerows, small woods, copses, tree lines and individual or groups of trees, herbaceous features (field margins, buffer strips, grass verges) wet features (ditches, small ponds and streams) and stony features (terraces, cairns).	JRC	✓	✗
19	Climate	Greenhouse gas emissions	Quantifies the direct emissions of two potent greenhouse gases from agriculture: methane (CH ₄) from enteric fermentation in livestock and manure management, and nitrous oxide (N ₂ O) from agricultural soils, particularly after nitrogen fertilizer application.	Eurostat/ EEA	✓	✗
8	Energy	Energy use in agriculture	Measures the total direct (e.g., fuel for tractors) and indirect (e.g., energy used to produce fertilizers) energy consumed by the agricultural sector. It is directly linked to the sector's carbon footprint and greenhouse gas emissions.	Eurostat	✗	✗
24	Energy	Renewable energy production	Measures the amount of renewable energy (e.g., biogas from manure, biofuels from crops) produced by the agricultural sector. It reflects a positive environmental contribution and a diversification of the rural economy.	Eurostat	✓	✗

Circles showing potential input from Earth Observation

STEP 3: Agri-Environmental-Indicators (2)

AEI	Class	Indicator Title	Comments	Data Holder	NUTS2	NUTS3
1	General	Agri-environmental commitments	Measures the extent to which farmers participate in voluntary agri-environment-climate measures (AECMs) funded under the CAP's Rural Development policy. It tracks the area of farmland managed under specific commitments (e.g., maintaining hedgerows, using low-input systems, protecting wetlands). This is a key Response indicator that also acts as a Driving Force by changing farming practices.	Eurostat	✓	✗
3	General	Farmers' training and environmental farm advisory services	Assesses the level of access farmers have to training and advice on environmental issues. It measures participation in relevant training courses and the use of Farm Advisory Systems (FAS), which help farmers comply with environmental legislation and adopt sustainable practices.	Eurostat	✓	✗
9	General	Land use change	Tracks the conversion of land between different categories, such as the change from permanent grassland to arable land, or the abandonment of farmland. Changes in land use have profound impacts on soil carbon stocks, biodiversity, and landscape character.	Eurostat	✗	✗
10.1	General	Cropping Patterns	Describes the relative share of different crops (e.g., cereals, oilseeds, fodder crops) within the total UAA. A trend towards simplification and monoculture can reduce habitat diversity and increase pest pressure, while diverse crop rotations can improve soil health.	Eurostat	✓	✗
12	General	Intensification/extensification	A composite indicator that shows the trend in the use of inputs (like fertilizers, pesticides, and feed) per unit of land or output. Intensification generally implies increased environmental pressure, while extensification can be beneficial for biodiversity.	Eurostat	✓	✗
13	General	Specialisation	Measures the degree to which farms and regions concentrate on a limited number of agricultural products. High specialization can lead to a loss of landscape diversity, reduced crop rotation benefits, and a disconnection between crop and livestock farming.	Eurostat	✓	✗
14	General	Risk of land abandonment (JRC)	Identifies agricultural areas, particularly in marginal regions (e.g., mountains), that are at high risk of being abandoned. Abandonment can have mixed environmental consequences, including potential biodiversity gains but also loss of valuable habitats and increased fire risk.	JRC	✓	✗
4	Reduce pesticides	Area under organic farming (see Organic farming statistics)	Tracks the share of UAA that is certified organic. Organic farming prohibits the use of synthetic pesticides and fertilizers and promotes practices that enhance biodiversity and soil health. Its growth reflects both policy support and consumer demand.	Eurostat	✓	✗
6	Reduce Pesticides	Consumption of pesticides	Tracks the volume of active substances sold for plant protection products, categorized by type (e.g., herbicides, fungicides, insecticides). It indicates the potential pressure on biodiversity (especially pollinators), soil health, and water quality.	Eurostat	✓	✗
17	Reduce Pesticides	Pesticide risk	Moves beyond simple consumption volumes (AEI 6) to assess the actual risk posed to the environment. It uses models that consider the toxicity of different active substances and their likely fate and exposure routes in the environment (e.g., risk to aquatic organisms or bees).	Eurostat	✗	✗

Circles showing potential input from Earth Observation

STEP 3 Agri-Environment-Indicators (3)

AEI	Class	Indicator Title	Comments	Data Holder	NUTS2	NUTS3
11.1	Soil quality	Soil cover	Assesses the percentage of arable land that is covered by vegetation (including main crops, catch crops, or residues) during periods when it is vulnerable to erosion, typically winter. Good soil cover reduces soil loss and nutrient leaching.	Eurostat	✓	✗
11.2	Soil quality	Tillage practices	Tracks the share of arable land managed under different tillage systems: conventional tillage (inverting the soil with a plough), conservation tillage (reduced soil disturbance), and zero-tillage. Conservation practices can improve soil structure, increase organic matter, and reduce erosion.	Eurostat	✓	✗
21	Soil quality	Soil erosion	Estimates the rate of soil loss from agricultural land due to water erosion. It is typically modeled using factors like rainfall patterns, soil erodibility, topography, crop cover, and management practices. Soil erosion degrades fertility and pollutes waterways.	JRC	✓	✓
26	Soil quality	Soil quality (JRC)	Assesses the health and condition of agricultural soils, often focusing on Soil Organic Carbon (SOC) content. SOC is vital for soil fertility, water retention, and carbon sequestration.	JRC	✗	✗
5	Water quality	Mineral fertiliser consumption	Measures the total national consumption of manufactured nitrogen (N) and phosphorus (P) fertilizers. It's a proxy for the pressure on the environment, as excess nutrients can lead to water pollution (eutrophication) and air pollution (ammonia and nitrous oxide emissions).	Eurostat	✓	✗
10.2	Water quality	Livestock Patterns	Measures livestock density, usually expressed in Livestock Units (LSU) per hectare of forage area. High densities can indicate intense pressure on the environment from manure production and associated nutrient surpluses and emissions.	Eurostat	✓	✗
11.3	Water quality	Manure storage	Assesses the type and capacity of manure storage facilities on farms. Inadequate storage can lead to significant emissions of ammonia and greenhouse gases, as well as nutrient runoff into watercourses.	Eurostat	✓	✗
15	Water quality	Gross nitrogen balance	Calculates the difference between all nitrogen inputs to a farming system (fertilizers, manure, atmospheric deposition, etc.) and all outputs (harvested crops, fodder, etc.). A large surplus represents a potential loss of nitrogen to the air and water, causing pollution.	Eurostat	✓	✗
16	Water quality	Risk of pollution by phosphorus	Models the potential for phosphorus to be lost from agricultural soils to nearby water bodies. It considers factors like the soil phosphorus content, application rates of manure and fertilizer, soil type, and climate. Phosphorus is a primary cause of eutrophication in freshwater.	Eurostat	✗	✗
27.1	Water quality	Nitrate pollution	Measures the concentration of nitrates in groundwater and surface water monitoring stations located in agricultural areas. It reflects the outcome of nitrogen pressure (from AEI 15) on the state of water bodies.	Eurostat/ EEA	✗	✗
27.2	Water quality	Pesticide pollution	Measures the concentration of specific pesticide residues and their metabolites in groundwater and surface water, providing a direct measure of the impact of pesticide use (AEI 6 and 17) on the aquatic environment.	Eurostat/ EEA	✗	✗
7	Water quantity and availability	Irrigation	Quantifies both the agricultural area equipped for irrigation and the actual area irrigated annually. It's a critical indicator of the pressure on freshwater resources, especially in southern Europe where water scarcity is a major issue.	Eurostat	✓	✗
20	Water quantity and availability	Water abstraction	Measures the volume of fresh surface water and groundwater that is abstracted for agricultural use, mainly for irrigation. It provides a direct measure of the pressure farming exerts on water resources.	Eurostat	✗	✗

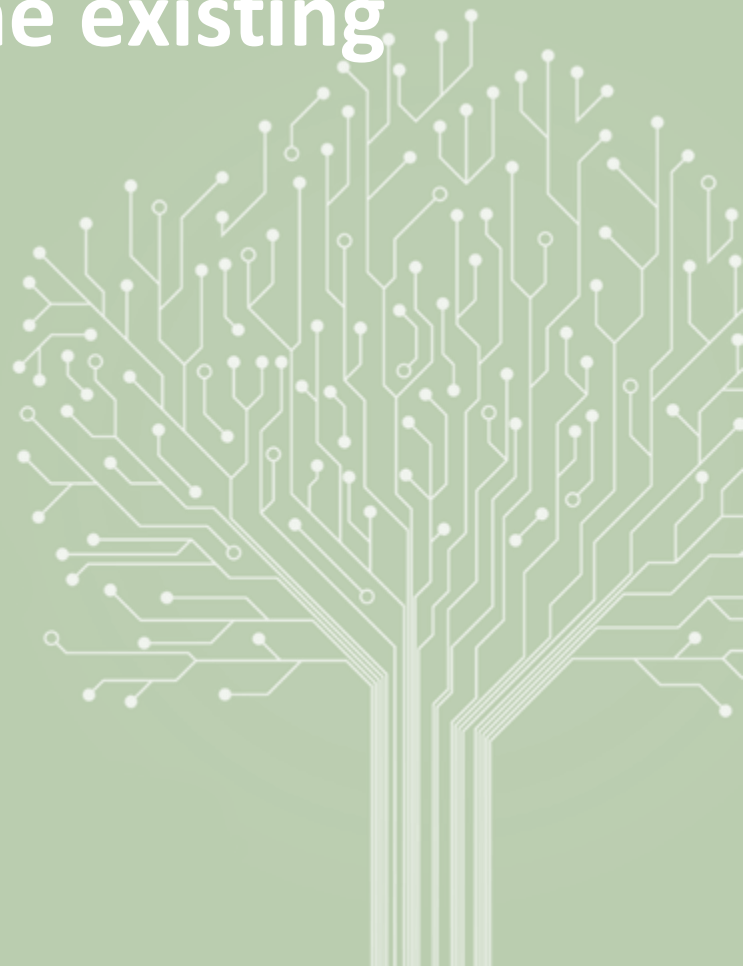


Circles showing potential input from Earth Observation



Step 4 - Add farm and parcel data to the existing CAP AEI Indicators

See [EURAF Policy Briefing #68](#) - *“Availability and use of IACS geospatial data in the EU”*



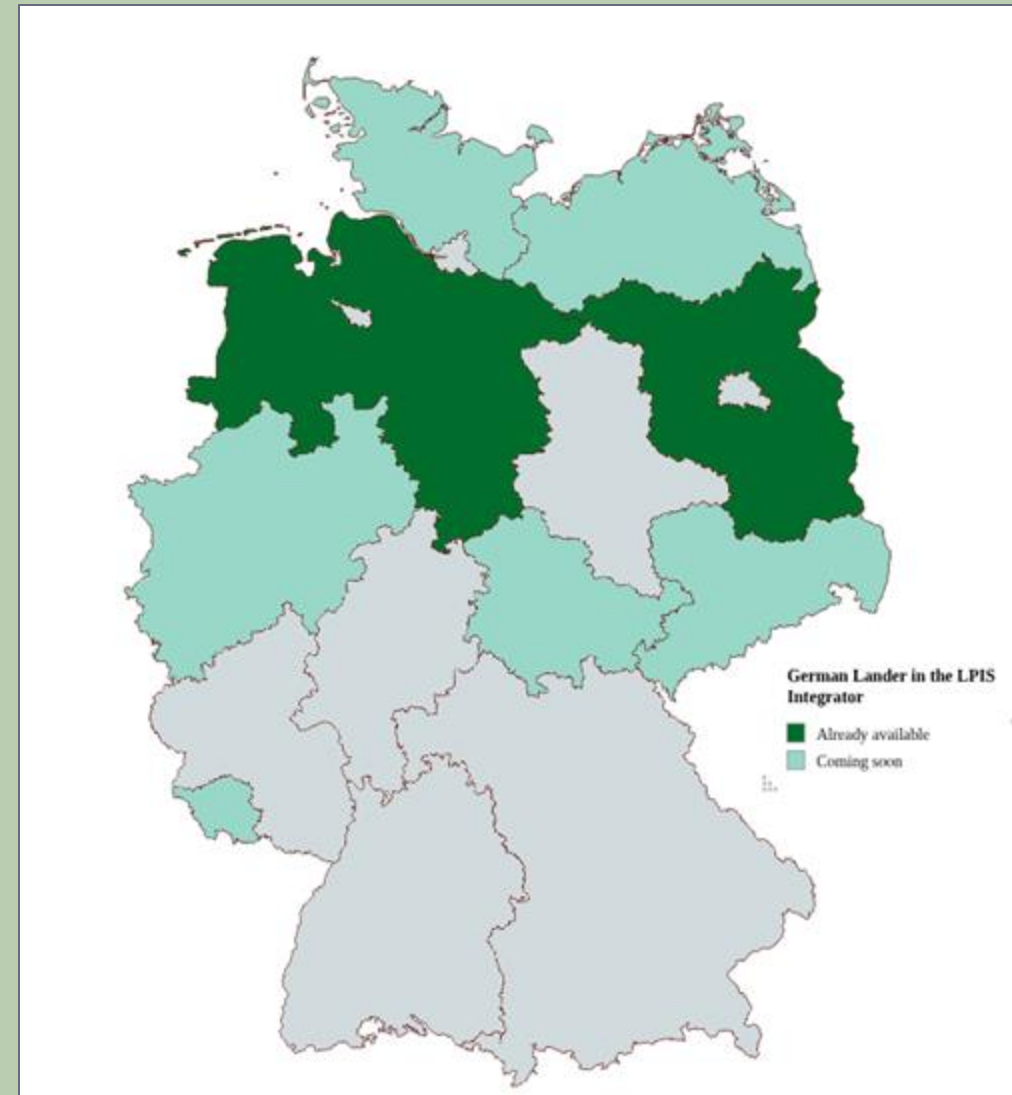
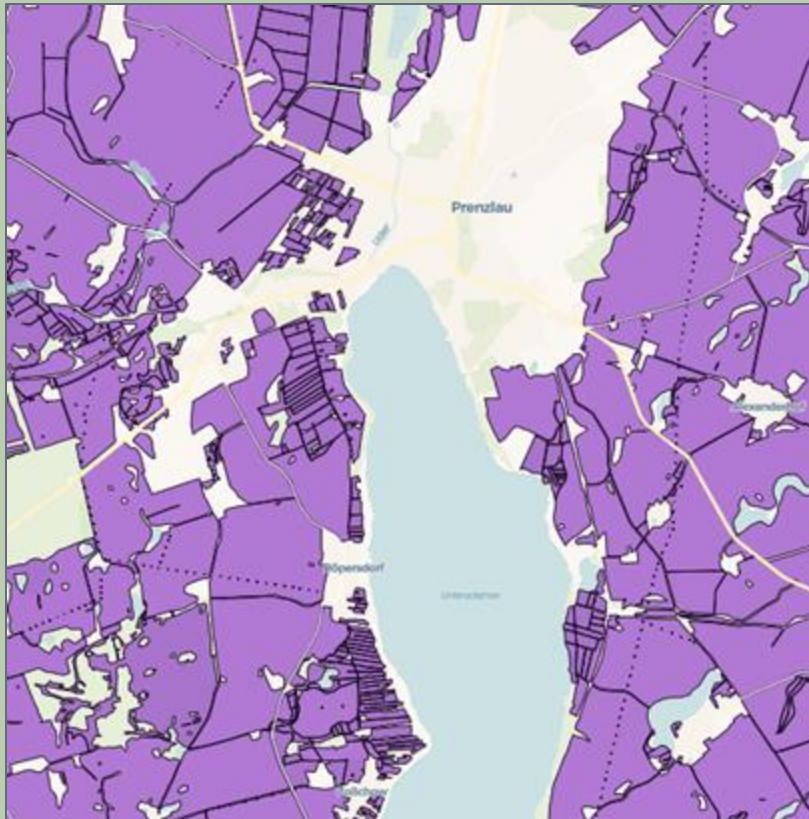
STEP 4: The Need for Open Data!! - compliance for LPIS/GSAA data with the EU HVD Reg (2023/238) (EURAF [Research Report #8](#))

Member State	Data Holder (Paying Agency)	Free of Charge	Licence	Machine-Readable Format	API Access	Bulk Download	Up-to-Date	Overall Assessment
Austria	Agrarmarkt Austria (AMA)	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Fully Compliant
Belgium (Flanders)	Agentschap Landbouw & Visserij	Partially Compliant	Partially Compliant	Compliant	Compliant	Non-Compliant	Compliant	Partially Compliant
Belgium (Wallonia)	Organisme Payeur de Wallonie	Compliant	Partially Compliant	Compliant	Compliant	Compliant	Compliant	Largely Compliant
Bulgaria	State Fund Agriculture	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant
Croatia	Agency for Payments in Agriculture, Fisheries and Rural Development (APRRRR)	Compliant	Partially Compliant	Compliant	Compliant	Partially Compliant	Partially Compliant	Partially Compliant
Cyprus	Cyprus Agricultural Payments Organization (CAPO)	Partially Compliant	Partially Compliant	Partially Compliant	Compliant	Non-Compliant	Partially Compliant	Partially Compliant
Czechia	State Agricultural Intervention Fund (SZIF)	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Largely Compliant
Denmark	Danish Agricultural Agency	Compliant	Compliant	Compliant	Partially Compliant	Compliant	Compliant	Largely Compliant
Estonia	Agricultural Registers and Information Board (ARIB/PRIA)	Compliant	Partially Compliant	Compliant	Compliant	Compliant	Compliant	Largely Compliant
Finland	Finnish Food Authority	Compliant	Compliant	Compliant	Compliant	Partially Compliant	Compliant	Largely Compliant
France	Agence de services et de paiement (ASP)	Compliant	Compliant	Compliant	Partially Compliant	Compliant	Partially Compliant	Largely Compliant
Germany	Federal Ministry of Food and Agriculture (BMEL) & 16 Länder Agencies	Partially Compliant	Non-Compliant	Partially Compliant	Partially Compliant	Partially Compliant	Partially Compliant	Highly Fragmented & Partially Compliant
Greece	Payment and Control Agency for Guidance and Guarantee Community Aid (OPEKEPE)	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant
Hungary	Hungarian State Treasury	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant
Ireland	Department of Agriculture, Food and the Marine (DAFM)	Compliant	Compliant	Compliant	Partially Compliant	Compliant	Compliant	Largely Compliant
Italy	Agency for Payments in Agriculture (AGEA) & Regional Bodies	Partially Compliant	Partially Compliant	Compliant	Compliant	Partially Compliant	Non-Compliant	Highly Fragmented & Partially Compliant
Latvia	Rural Support Service (LAD)	Compliant	Compliant	Compliant	Compliant	Partially Compliant	Compliant	Largely Compliant
Lithuania	National Paying Agency (NMA)	Partially Compliant	Partially Compliant	Compliant	Partially Compliant	Compliant	Compliant	Partially Compliant
Luxembourg	Service d'Economie Rurale (SER)	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Fully Compliant
Malta	Agriculture and Rural Payments Agency (ARPA)	Compliant	Partially Compliant	Partially Compliant	Compliant	Non-Compliant	Partially Compliant	Partially Compliant
Netherlands	Netherlands Enterprise Agency (RVO)	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Fully Compliant
Poland	Agency for Restructuring and Modernisation of Agriculture (ARMA)	Partially Compliant	Partially Compliant	Compliant	Partially Compliant	Partially Compliant	Partially Compliant	Partially Compliant
Portugal	Institute for the Financing of Agriculture and Fisheries (IFAP)	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Fully compliant
Romania	Agency for Payments and Intervention in Agriculture (APIA)	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant	Non-Compliant
Slovakia	Agricultural Paying Agency (PPA)	Compliant	Compliant	Compliant	Partially Compliant	Compliant	Compliant	Largely Compliant
Slovenia	Agency for Agricultural Markets and Rural Development (ARSKTRP)	Compliant	Compliant	Compliant	Partially Compliant	Compliant	Compliant	Largely Compliant
Spain	Fondo Español de Garantía Agraria (FEGA) & 18 Regional Bodies	Compliant	Partially Compliant	Compliant	Compliant	Compliant	Compliant	Largely Compliant but Fragmented
Sweden	Swedish Board of Agriculture	Compliant	Compliant	Compliant	Partially Compliant	Compliant	Compliant	Largely Compliant

STEP 4: Italian regions which have achieved partial compliance with the High Value Datasets Regulation for GSAA and LPIS data ([EURAF Research Report #20](#))



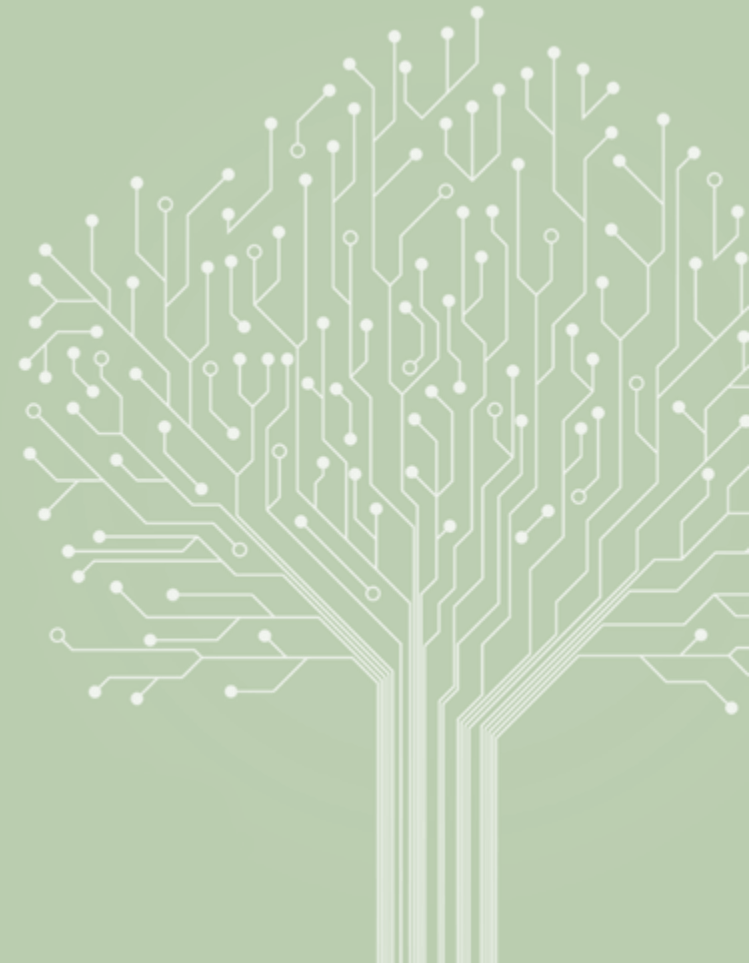
STEP 4 German regions which have achieved partial compliance with the High Value Datasets Regulation for GSAA and LPIS data ([EURAF Research Report #21](#))





Step 5 - Link to parcel-scale calculation of LULUCF/AFOLU emissions

See [EURAF Policy Briefing #17](#) - “Agroforestry in the revised LULUCF Regulation”



STEP 5: Difference between FOREST and AGROFOREST

Definition of FOREST:

A minimum area of land of **0.05-1.0 hectares** with tree crown cover (or equivalent stocking level) of more than 10-30 per cent with trees with the potential to reach a minimum height of 2-5 metres at maturity in situ...

UNFCCC - Marrakesh Accords CCC/CP/ 2001/13/Add.1

Definition of PERMANENT GRASSLAND:

One choice available to Member States in their CAP Strategic Plans is: “including other species such as **shrubs and or trees** which could be grazed and/or produce animal feed, where grasses and other herbaceous forage are traditionally **not predominant or are absent** in grazing areas”

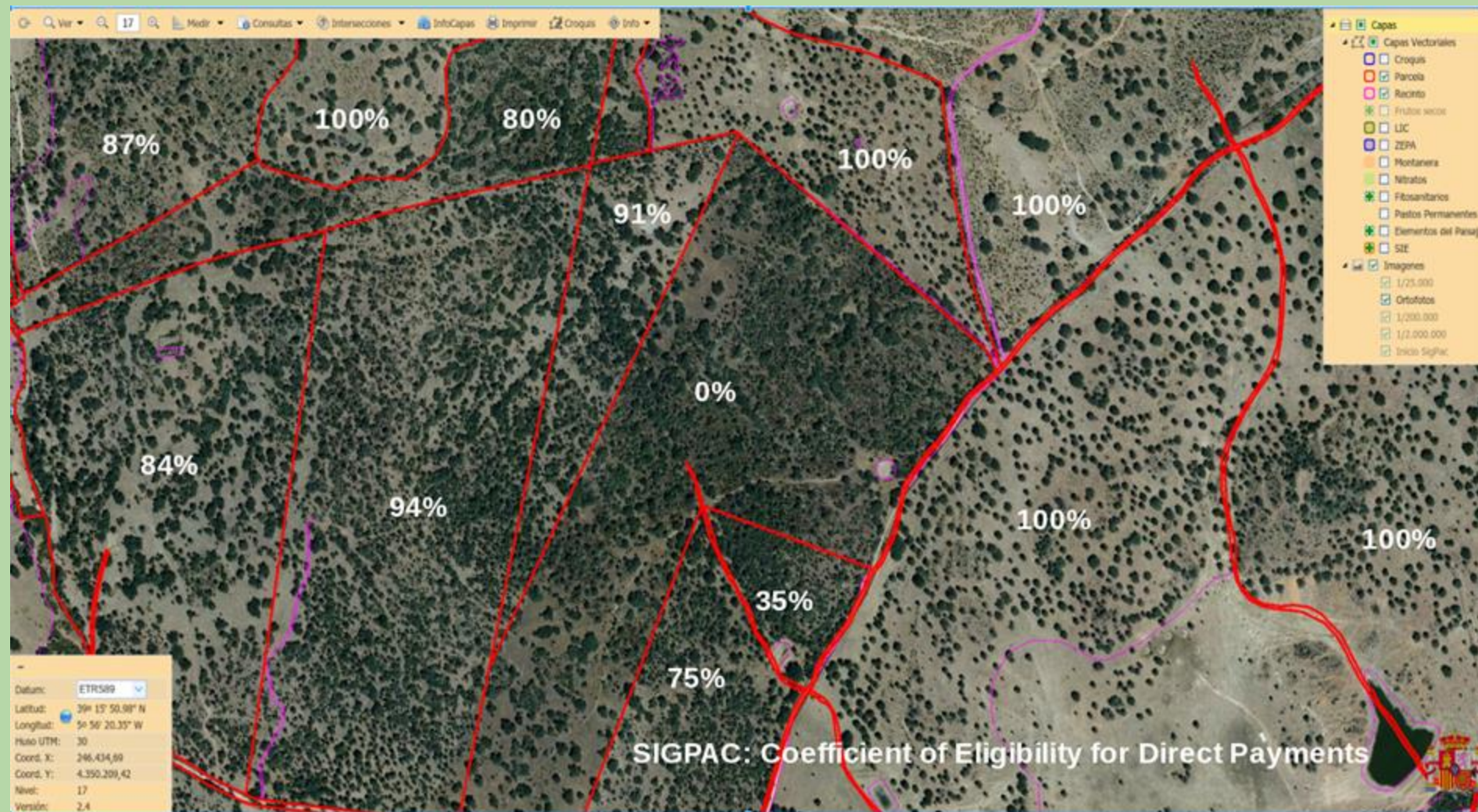
(But this option has been selected only by ES and IE over their whole territory, and by BEW, DE, IT, PT and SE over part of their territories)

EU Member States defined their forests in the LULUCF Regulation (2018/841)- blocks smaller than “forests” are “agroforestry” on grassland or cropland.

Member State	Area (ha)	Tree crown cover (%)	Tree height (m)	Minimum width (m)
Malta	1,0	30	5	
Spain	1,0	20	3	25
Portugal	1,0	10	5	20
Hungary	0,5	30	5	10
Estonia	0,5	30	2	
Belgium	0,5	20	5	
Netherlands	0,5	20	5	30
Denmark	0,5	10	5	20
Finland	0,5	10	5	20
France	0,5	10	5	
Italy	0,5	10	5	
Luxembourg	0,5	10	5	
Sweden	0,5	10	5	10
Greece	0,3	25	2	
Slovakia	0,3	20	5	
Cyprus	0,3	10	5	
Slovenia	0,25	30	2	
Romania	0,25	10	5	20
Lithuania	0,1	30	5	10
Ireland	0,1	20	5	20
Latvia	0,1	20	5	20
United Kingdom	0,1	20	2	20
Bulgaria	0,1	10	5	
Germany	0,1	10	5	
Croatia	0,1	10	2	
Poland	0,1	10	2	10
Austria	0,05	30	2	10
Czech Republic	0,05	30	2	20

STEP 5 LPIS orthophotos shows the density and distribution of individual trees.

This shows a scene near Trujillo from the Spanish Land Parcel Identification System (SIGPAC). An automatic algorithm - based on tree crown-cover, slope and bare ground - calculates the eligibility of each parcel direct payments





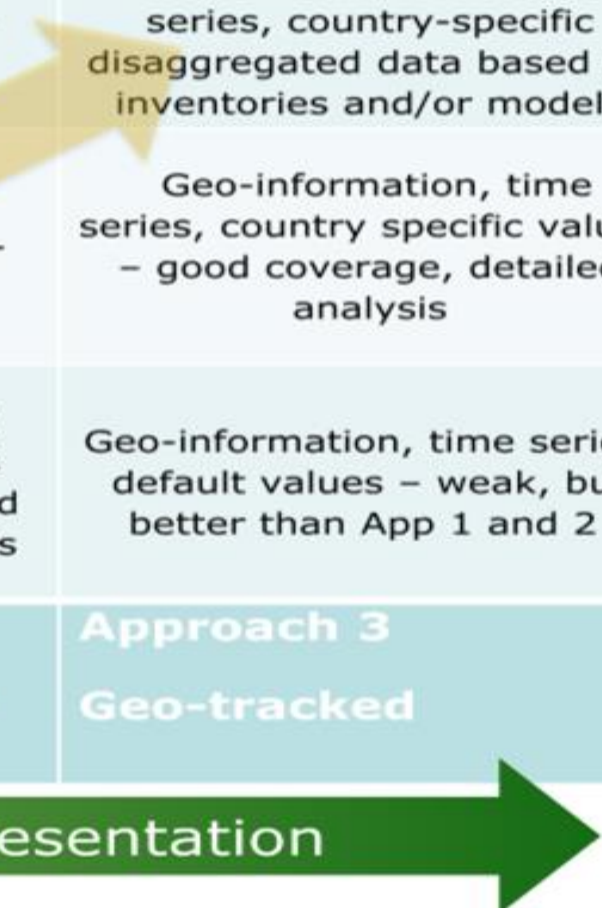
STEP 5: Sharing data between CRCF and AFOLU estimates

Improving the accuracy and robustness of estimates

Reduced Uncertainty

Tier 3 High res. data (e.g. model)	Not applicable	Modelled data combined with LUC matrix (not necessarily spatially dis-aggregated)	Geo-information at high-resolution, detailed time series, country-specific disaggregated data based on inventories and/or models
Tier 2 Country specific values	National area statistics, combined with country-specific values – typical 1 st improvement	Annual LUC stats, combined with country-specific values	Geo-information, time series, country specific values – good coverage, detailed analysis
Tier 1 IPCC default values	National area statistics, combined with IPCC default values – basic entry level	Annual (or annualised) LUC stats presented as national matrix – applied using default IPCC values	Geo-information, time series, default values – weak, but better than App 1 and 2
	Approach 1 National statistics	Approach 2 Land Use Change matrix	Approach 3 Geo-tracked

Improved Land coverage and representation







Step 6 - Add modern measurement methods for biodiversity


See [EURAF Policy Briefing #66](#) - *Agroforestry for carbon farming - biodiversity and the protection of ecosystems*





STEP 6: Modern methods to quantify biodiversity in the EU ...


 **Environmental DNA (eDNA) Metabarcoding** This non-invasive technique analyzes genetic material from environmental samples (like water or soil) to identify the presence of a wide range of species without direct observation.


 **Remote Sensing and Satellite Imagery** High-resolution satellite imagery and LiDAR are used to map and monitor habitats and ecosystem health over vast areas, assessing factors like vegetation and land-use change.


 **Acoustic Monitoring** Automated sensors record environmental sounds to identify and monitor vocalizing species such as birds, bats, and amphibians, providing insights into their populations and behaviors.


 **Artificial Intelligence and Machine Learning** AI algorithms automate the process of analyzing large datasets, such as identifying species from camera trap images or audio recordings, which significantly speeds up biodiversity assessment.


 **Citizen Science** This method engages the public in collecting biodiversity data through mobile apps and projects, creating massive, geographically extensive datasets of species sightings.

 **Genomic Techniques** Advances like DNA barcoding and whole-genome sequencing provide deep insights into biodiversity, helping to precisely identify species and assess the genetic diversity within populations.

 **Camera Trapping** Motion-activated cameras are deployed to survey wildlife, especially elusive mammals, gathering data on species presence, abundance, and behavior with minimal disturbance.

 **Drone (UAV) Technology** Drones equipped with high-resolution cameras provide flexible and detailed aerial data for habitat mapping, wildlife counts, and monitoring ecosystem changes in hard-to-reach areas.

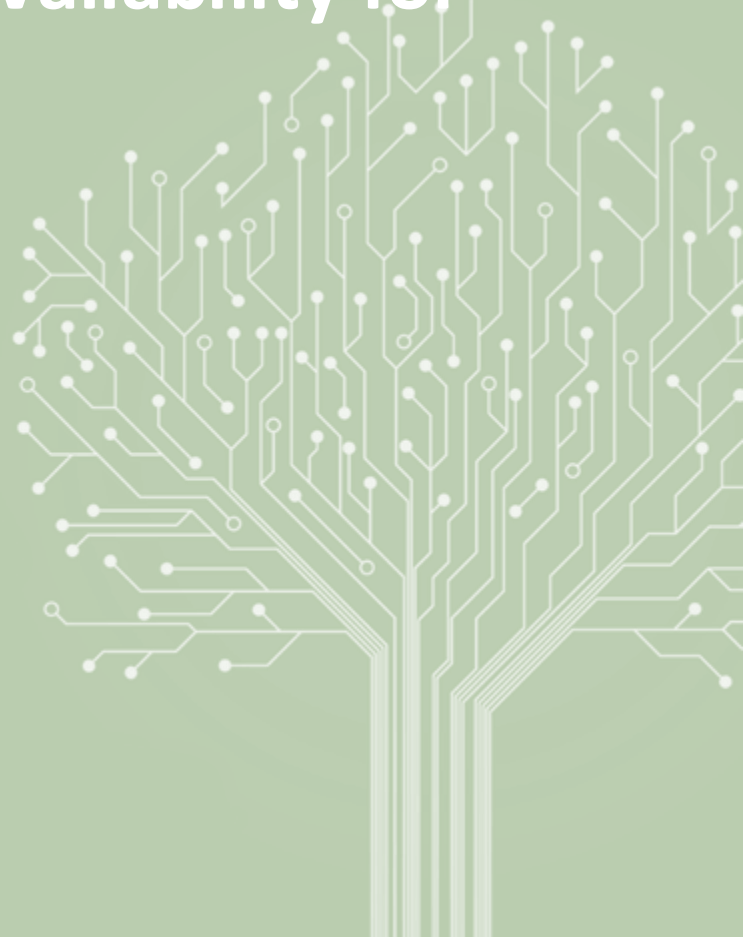
 **Biodiversity Footprinting** This is an assessment method used to calculate the impact of economic activities, products, or investments on biodiversity, helping to guide more sustainable business practices.

 **Species Distribution Models (SDMs)** These are computer algorithms that combine species observation data with environmental variables to predict and map potential habitats, which is essential for conservation planning and predicting climate change impacts.



Step 7 - Quantify the co-benefits and land availability for nature based solutions like agroforestry

See [EURAF Policy Briefing #2](#) - *Agroforestry in the EU Forest Strategy*



STEP 7: Adaptation to climate change (R12):

“Share of agricultural land under commitments to improve climate adaptation”

E.g. Wind: Cyclone Klaus destroyed 6 million M3 of timber in France in 2009, but agroforestry areas in its path were untouched because of deeper roots.



STEP 7: Reducing emissions in the livestock sector (R.13):

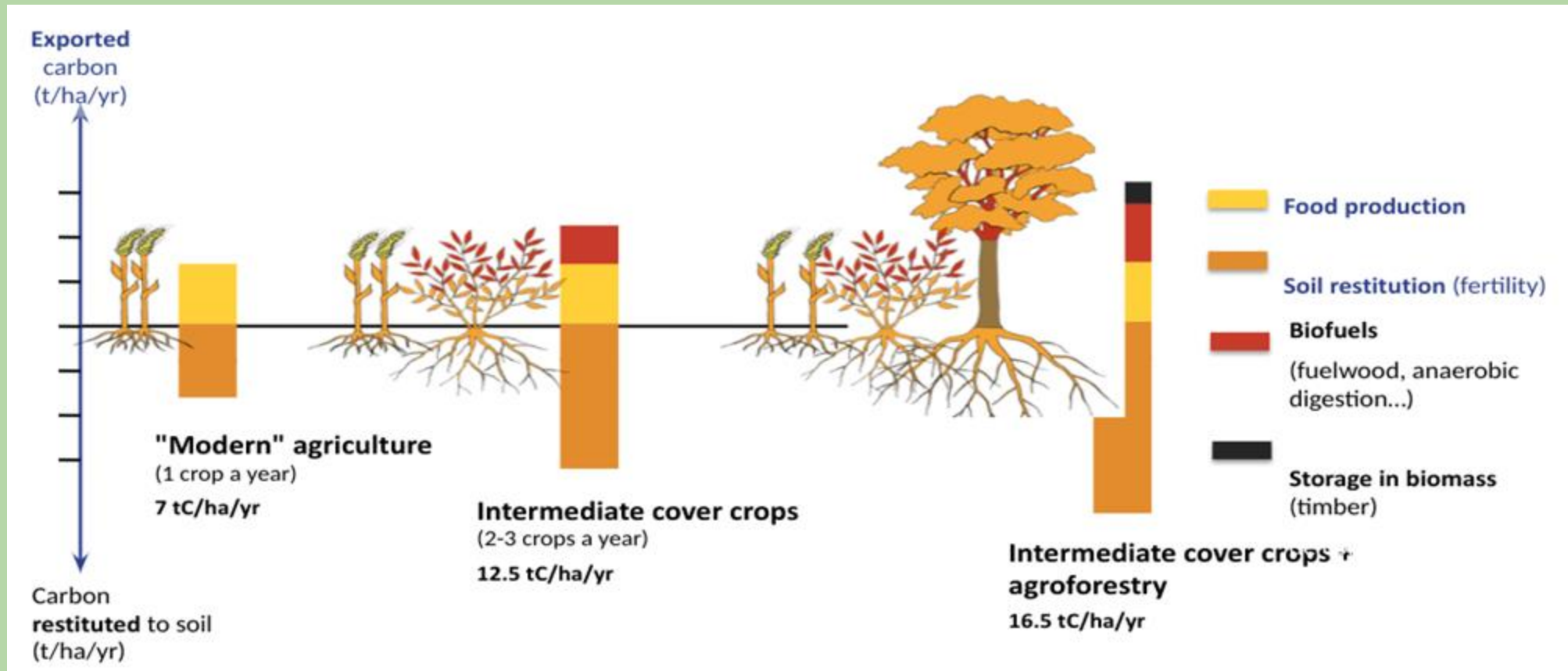
“Share of livestock units under support to reduce GHG emissions and/or ammonia, including manure management.”

E.g. In addition to the animal welfare effects of shade and shelter, tree foliage (e.g. coppicing) can give animal feed high in both tannins and protein - which can reduce methane emissions



STEP 7: Carbon storage in soils and biomass (R.14):

“Share of agricultural land under commitments to reducing emissions, maintaining and/or enhancing carbon storage (permanent grassland, agroforestry)”



Green energy from agriculture and forestry (R.15):

“Investments in renewable energy production capacity, including bio-based (MW)”



JRC SCIENCE FOR POLICY REPORT

The use of woody biomass for energy production in the EU

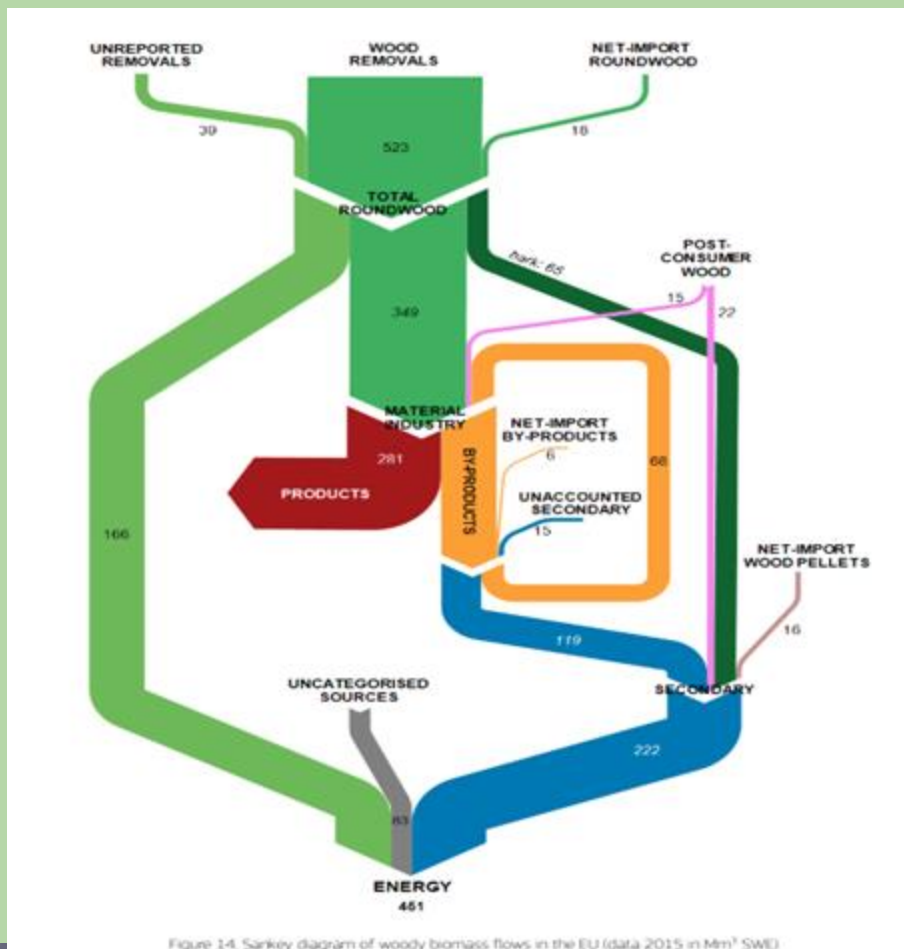


Figure 14. Sankey diagram of woody biomass flows in the EU (data 2015 in Mm³ SWE)

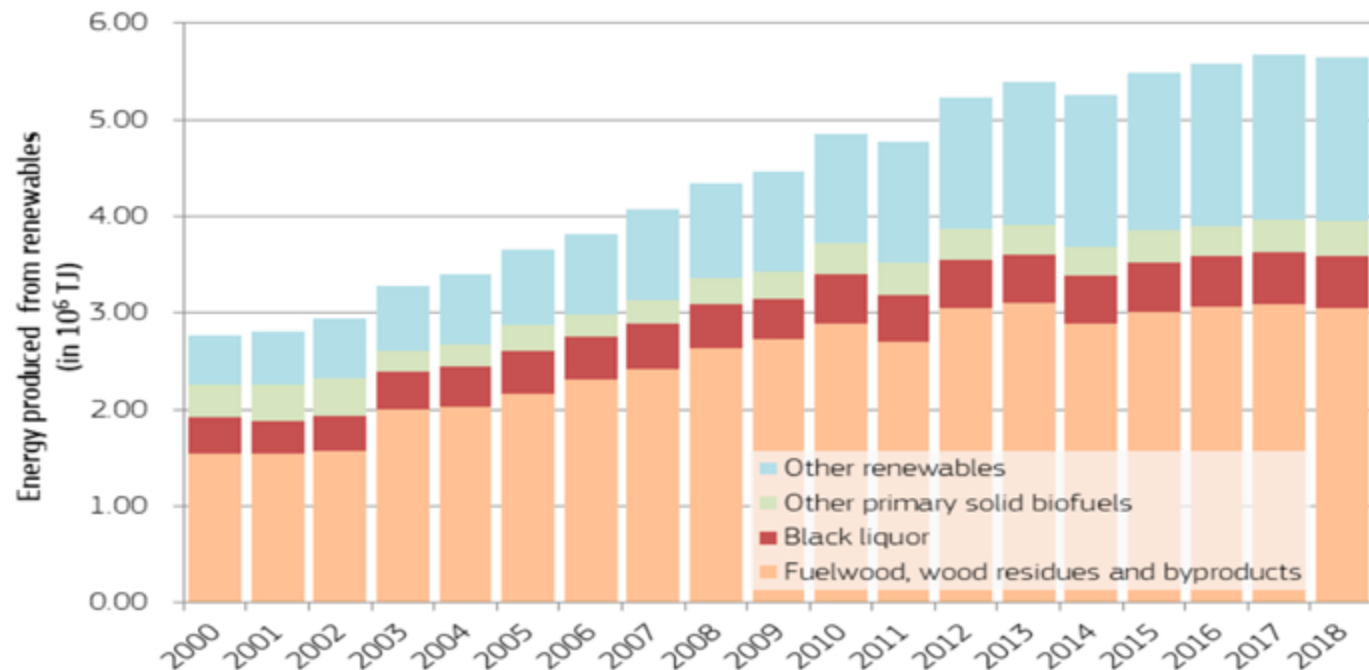


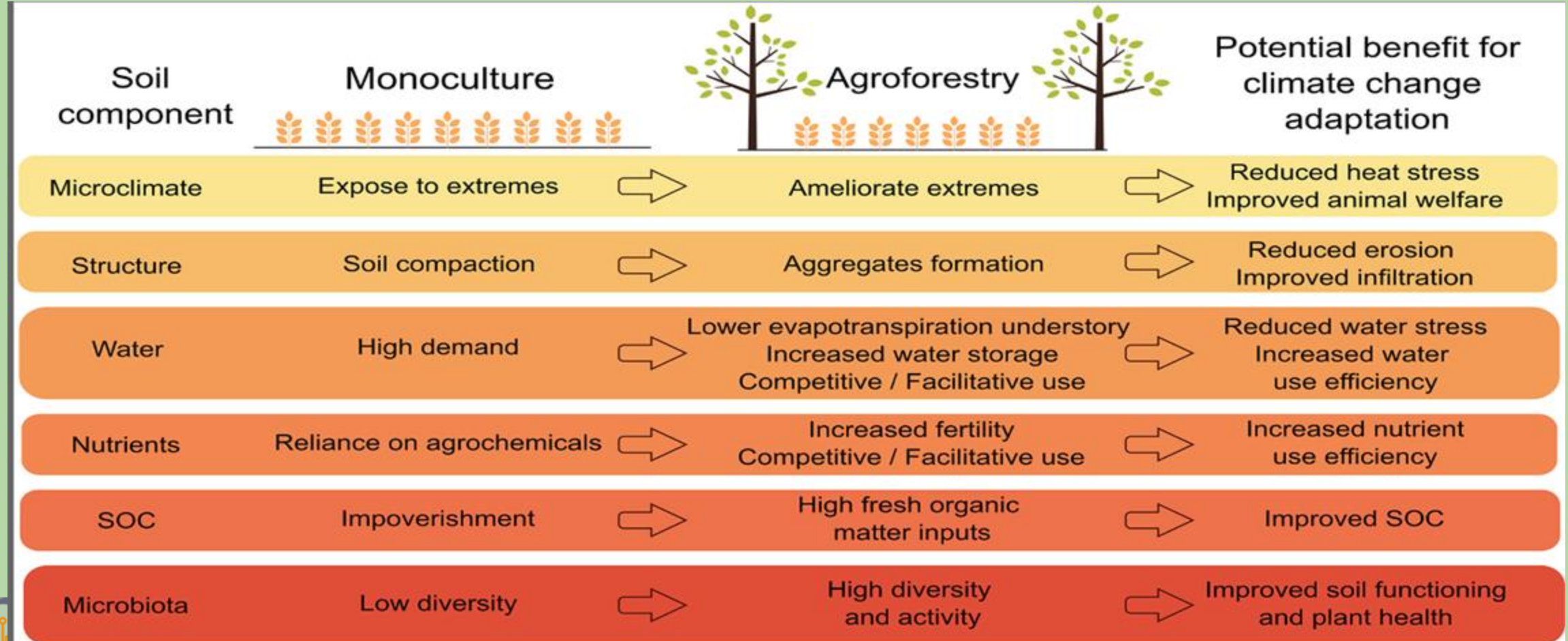
Figure 9. Indigenous production of renewable energy in the EU and share of wood-based energy (source: Eurostat nrg_cb_rw)

E.g. Bioenergy already gives 2/3rds of Europe’s Renewable Energy, and wood products half. Can agroforestry contribute further to this without losing more land from agriculture?

Improving soils (R.18):

“Share of agricultural land under management commitments beneficial for soil management”

Agroforestry has proven benefits in increasing soil carbon, soil structure and soil health



Improving air quality (R.19):

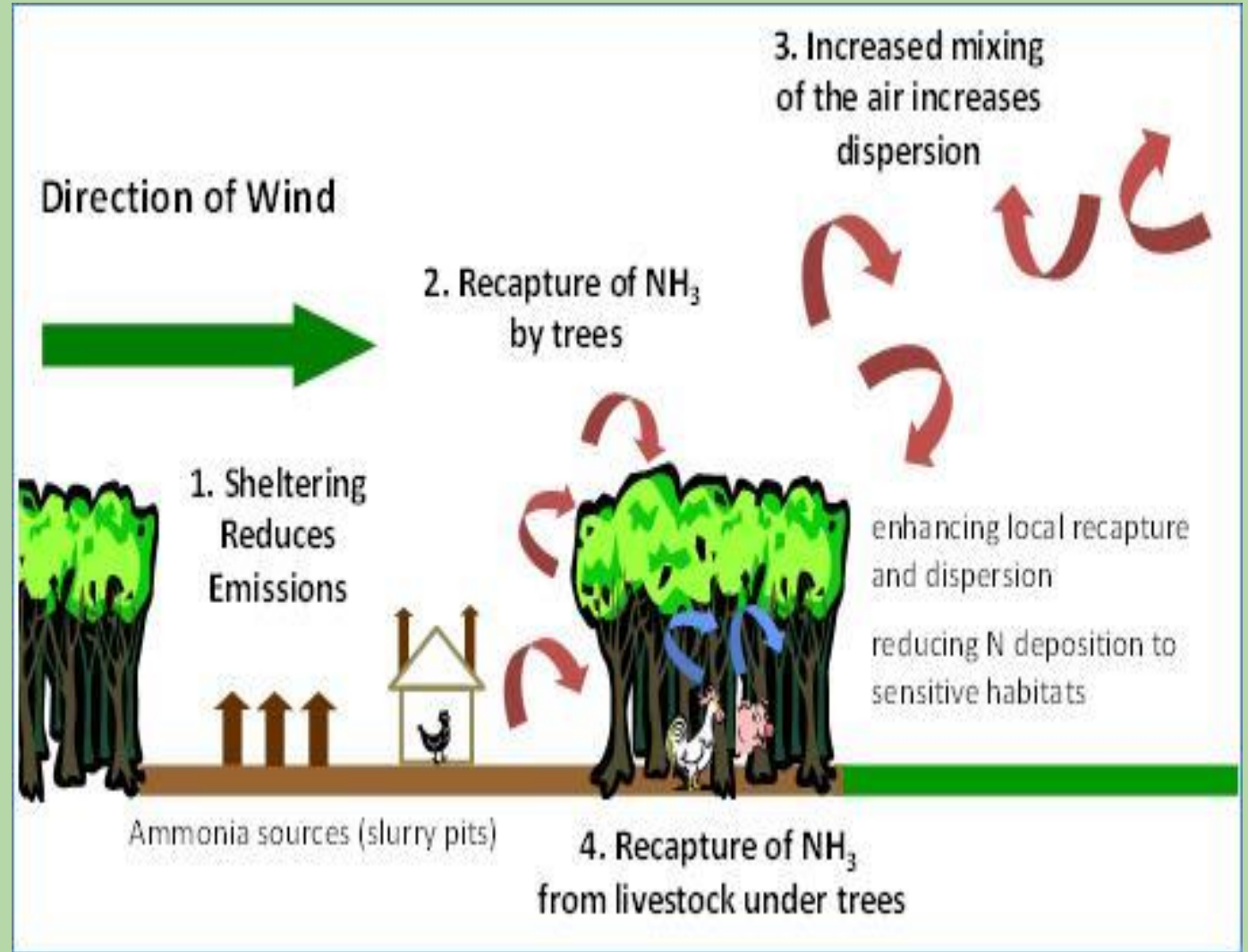
“Share of agricultural land under commitments to reduce ammonia emission”

Trees can can **recapture from 20% (trees planted around housing systems), to 45% (livestock as understorey silvopastoral systems) of ammonia.**

Trees planted in ammonia hotspots lead to reduced N deposition on nearby sensitive habitats.

Costs of planting and managing trees (ignoring future yields) were similar to other methods of abatement.

See Bealey, W. J., B. Loubet, C. F. Braban, D. Famulari, M. R. Theobald, S. Reis, D. S. Reay, and M. A. Sutton. 2014. “Modelling Agro-Forestry Scenarios for Ammonia Abatement in the Landscape.” *Environmental Research Letters*: 9 (12): 125001.



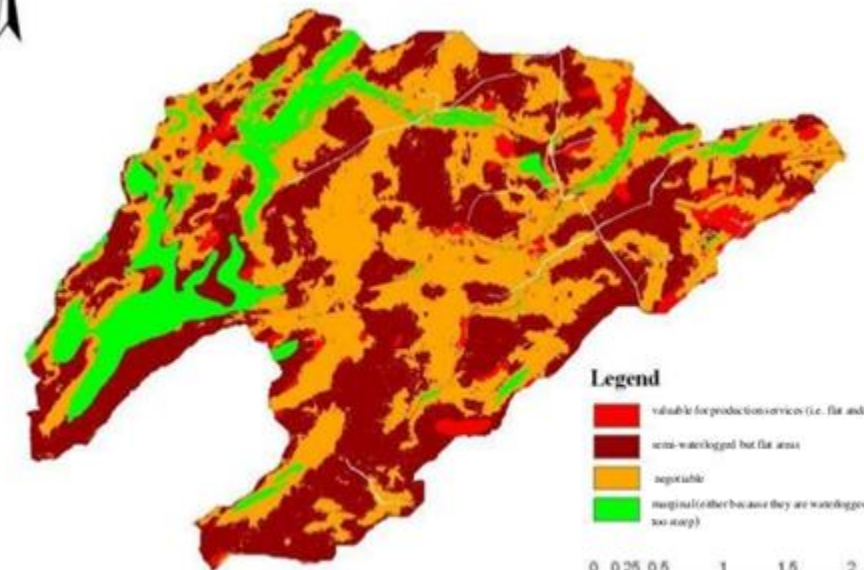
Protecting water quality (R.20) : “Share of agricultural land under management commitments for water quality”

Groups of farmers can design small-scale tree planting to **maximise rainfall penetration and minimise flood risk** (Pontbren, Wales)

Details [here](#)



Farm impact – plant trees on wet and sloping areas (green) not flat and dry (red); much of the catchment negotiable (orange).

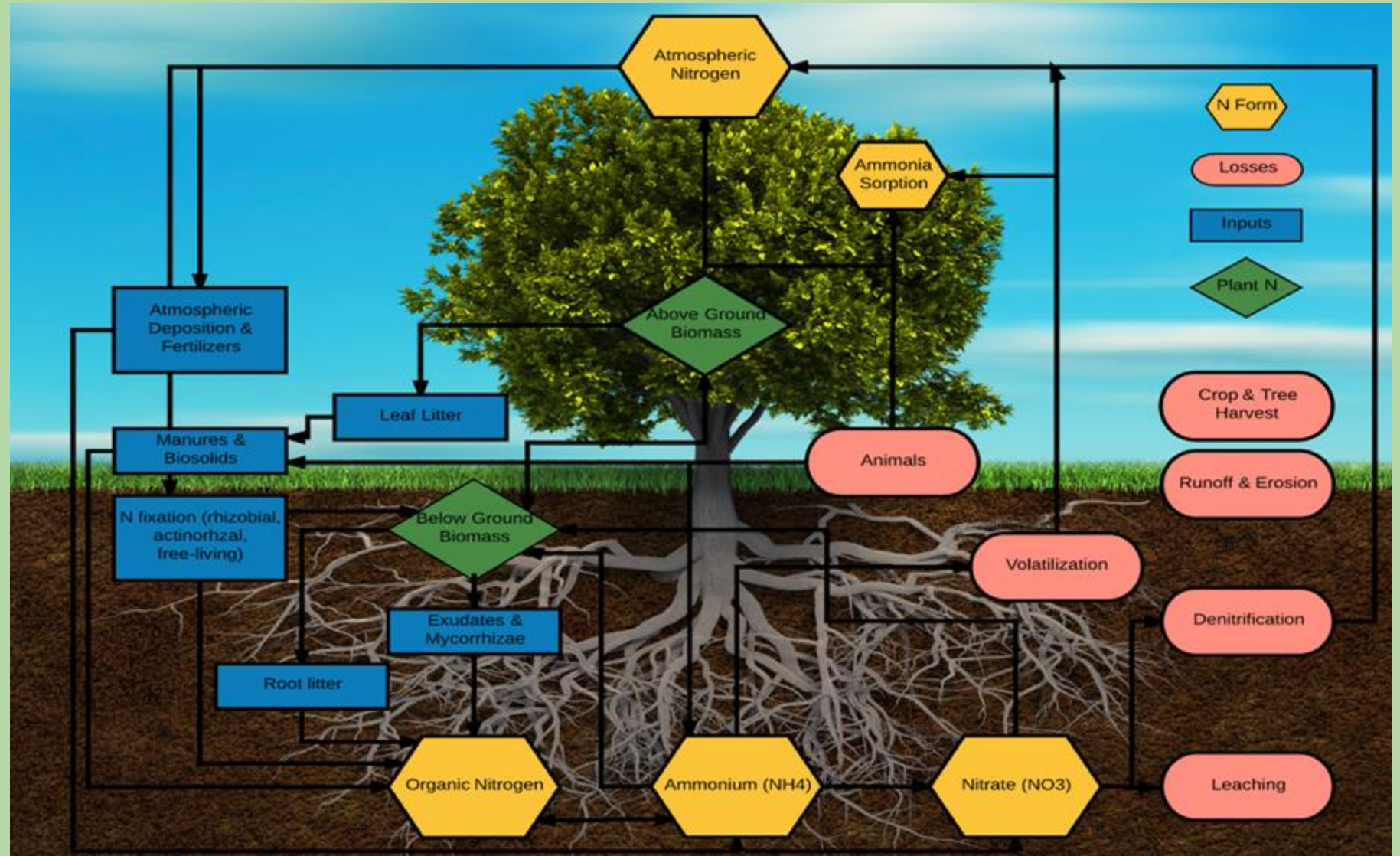


Sustainable nutrient management (R.21):

“Share of agricultural land under commitments related to improved nutrient management”

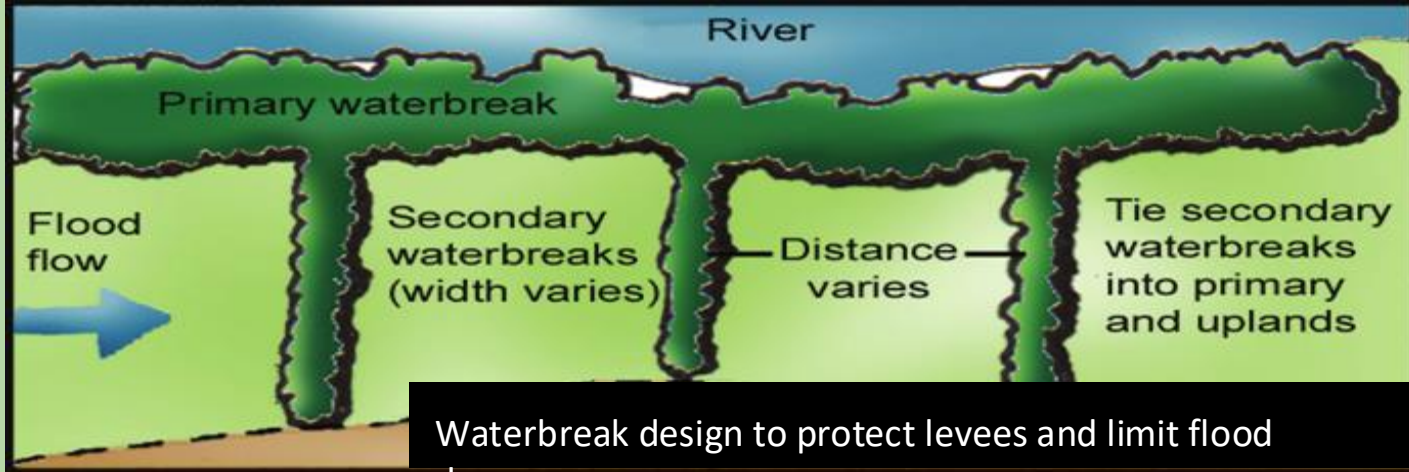
Positive Effects:

- Root “safety-net”
- Nitrogen fixation
- Shared mycorrhizae
- Soil structure/ SOM
- Enhanced soil carbon
- Root exudates
- Leaf and root litter
- Leaf forage/Manure
- Higher LER
- Hydraulic Conductivity
- Erosion control
- Reduced leaching
- Ammonia sorption
- Soil drying spring/autumn
- Hydraulic lift
- Riparian bufferstrips
- Water breaks



Sustainable water use (R.22):

“Share of irrigated land under commitments to improve water balance”



Waterbreak design to protect levees and limit flood damage

The Biotic pump .. how forests bring the rain
<https://youtu.be/kKL40aBg-7E>



Heuvelland, Flanders. Fruit trees & shrubs to be planted on the berm.



Berm & swale AF on same farm, after berm was planted with strawberries.



Agroforestry waterbreak ... Gardon valley

Environment-climate-performance through investment (R.23):

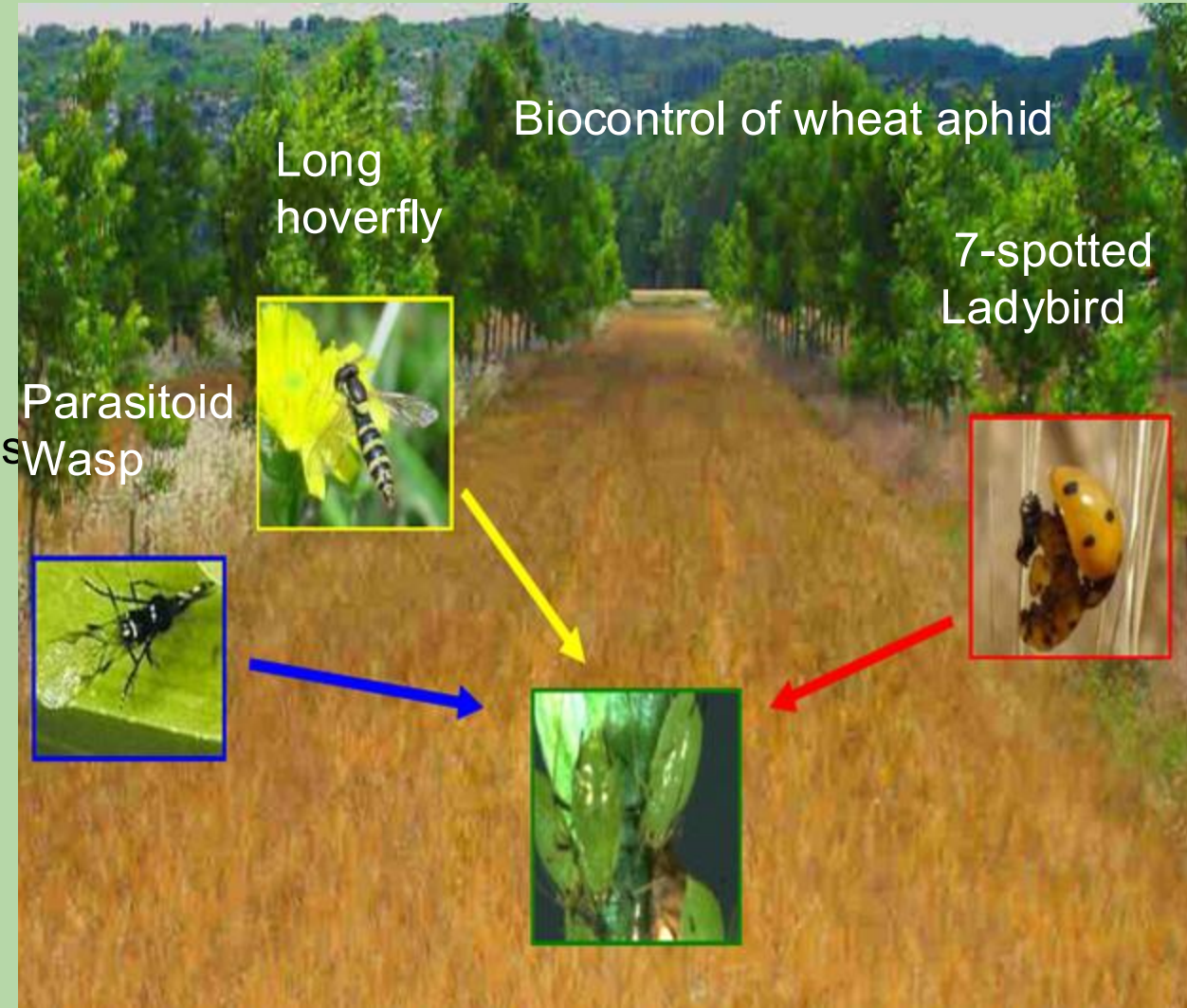
“Share of farmers with support in investments related to care for the environment or climate”

Crop Protection

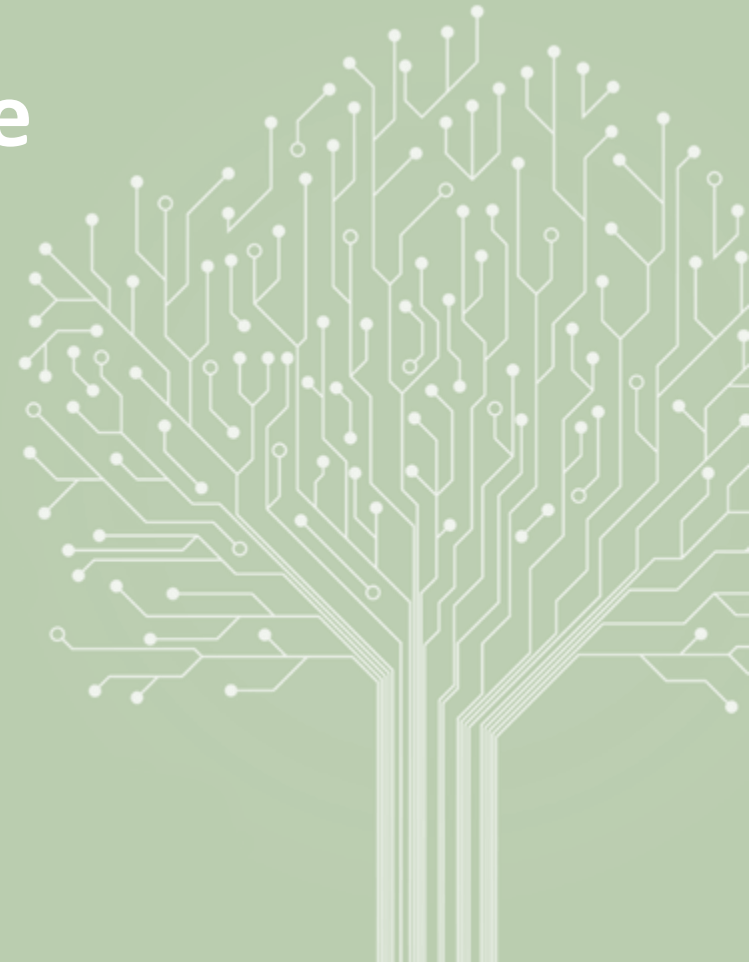
- tree rows can serve as a refuge for crop-pests & weeds but also shelter species which predate on pests

Biodiversity

- flowers of trees & tree rows provide nectar and pollen
- fruit and mast gives food for birds and wild animals
- insects are food for birds and bats
- bats need lines of trees to navigate
- landscape corridors give small mammals foraging and migration
- vegetation in tree rows gives habitats for bumblebees wildflowers in the tree-rows favour pollinators - like bumblebees, bees, butterflies, moths, flies, beetles, wasps and thrips



**Step 8 - emphasise that we are failing
the LULUCF Challenge and that massive
tree-planting is needed NOW**



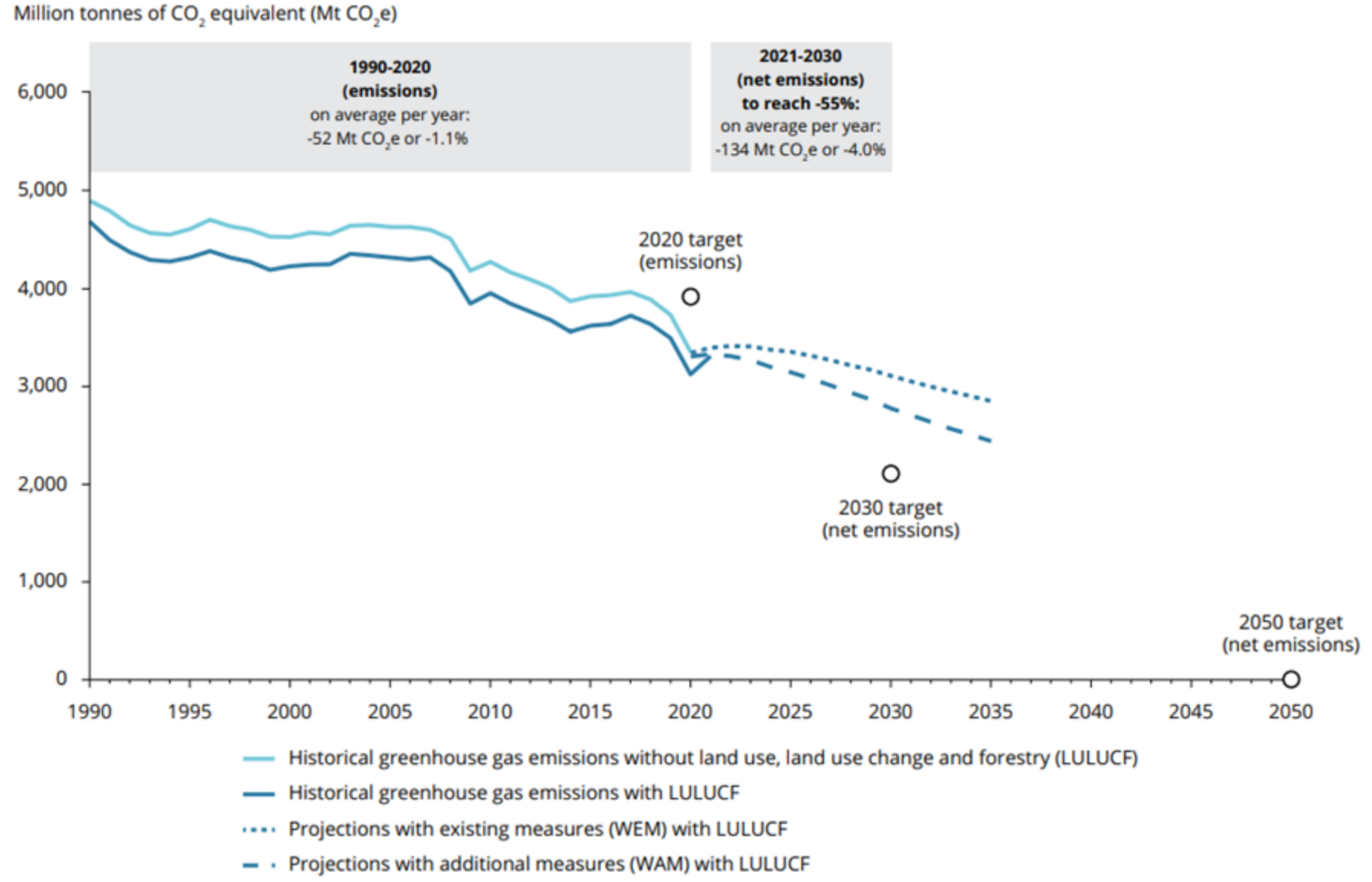
Most recent Climate Predictions (EEA 2022)

Europe is **NOT** on target

Agriculture must play a part

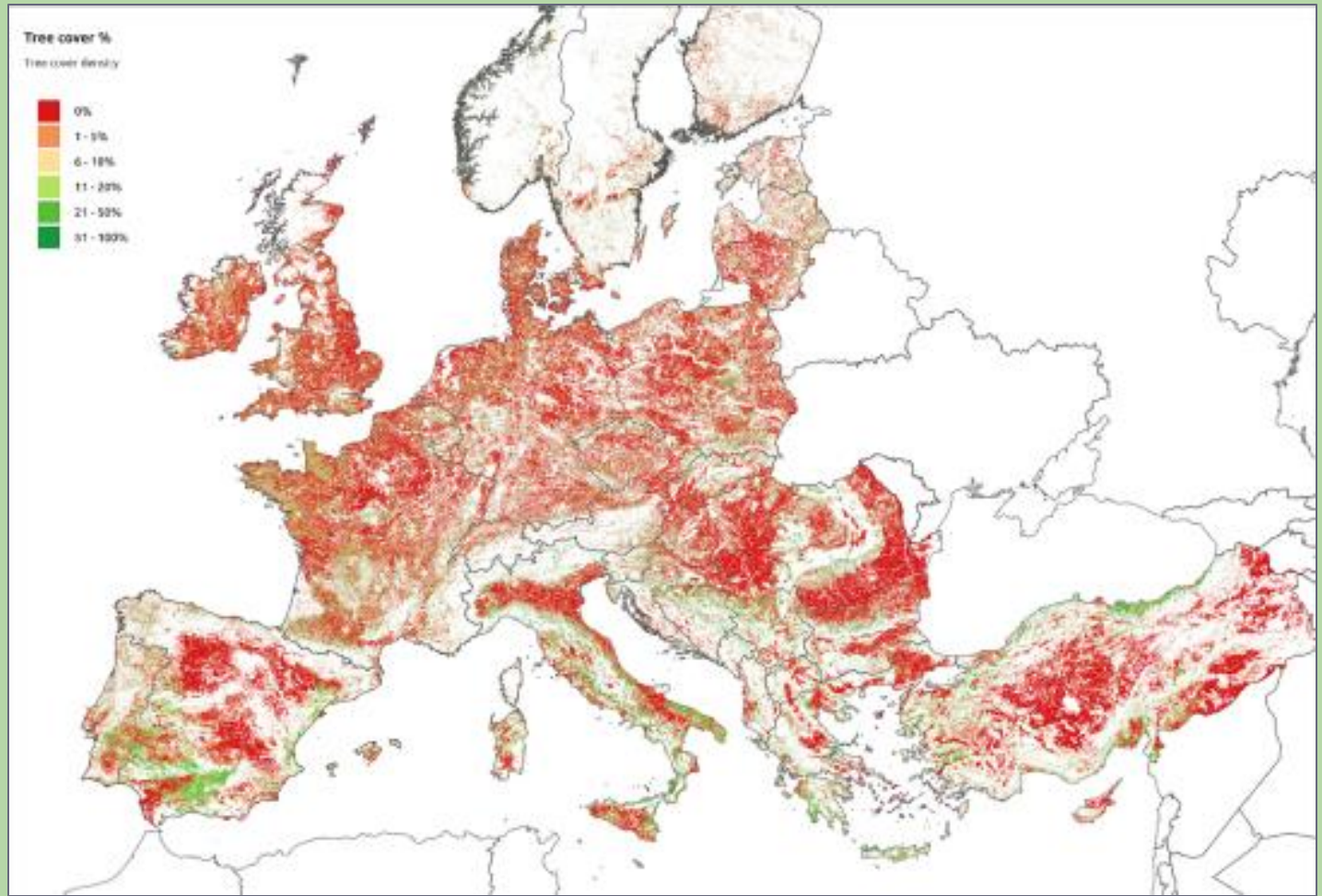


Figure ES.1 Historical trends and future projections for greenhouse gas emissions





EURAF Target - "10% tree crown cover on ALL agricultural land by 2040" Turning the red green



Priority planting areas, where tree cover density (% tree cover) on agricultural land is particularly low. Source: Copernicus tree cover density 2015 overlaid on LUCAS agricultural land use.

[Den Herder et al. \(2017\)](#) estimate that the total area under agroforestry in the EU 27 is about 15.4 million ha which is equivalent to about 3.6% of the territorial area and 8.8% of the utilised agricultural area.

[Den Herder et al \(2020\)](#) show that **1.69 million km² of European agricultural land has 0% tree cover. An area of 1.71 million km² of agricultural land has less than 1% tree cover. This should be the priority area for agroforestry tree planting.**

2. Agroforestry in the EU Forest Strategy

EURAF Policy Briefing No 2, v1 Sep 2020. Authors: Michael den Herder (EFI), Sonja Kay (AGROSCOPE), Gerry Lawson (EURAF), Patrick Worms (WAC-ICRAF). Comments to policy@euraf.net. DOI: 10.5281/zenodo.7936685



We can't repeat this TCD% x CORINE 100m map with COPERNICUS 10m grassland ... because trees (>10%TCD) are masked