8. Agroforestry for Carbon Farming in Europe

EURAF Policy Briefing No 8 v4. (1/9/20, 2/12/21, 3/4/22, 28/4/24) Gerry Lawson (policy@euraf.net), Sonja Kay, (AGROSCOPE), Christian Dupraz (INRAE)[1] https://zenodo.org/record/7953209

This updated Policy Briefing reflects the revised text of the EU Regulation for a Carbon Removals Certification Framework (CRCF). It a) summarises current estimates of the carbon sequestration potential of agroforestry in Europe, b) provides a timeline and references for studies of carbon farming in the EU; c) considers how the specific monitoring requirements of the CRCF can be met by agroforestry projects; d) suggests that the data needed for the certification of carbon farming could be shared on a local, regional and national scale and e) outlines overlaps with other key European policies and initiatives. EURAF suggests that new agroforestry systems on mineral soils with sparse tree cover have the greatest potential to capture carbon, while maintaining agricultural production and contributing environmental benefits. A programme of 750.000 ha agroforestry planting per annum on cropland and grassland in the EU-27 (i.e. 11.2 million ha by 2040) would ensure at least 10% tree-crown-cover on this type of land in all NUTS3 areas ("counties"). This land would remain in agricultural use and would contribute 56 Mt CO2e per year from the tree and soil component - assuming an average yield of 1.35 t C/ha/yr, or 5 t CO2/ha/yr. Integration of CAP Pillar I and Pillar II support with longer-term funding from voluntary or statutory carbon-farming schemes will be key to successfully establishing this area.

1 Agroforestry and Carbon Sequestration Potential

Agroforestry is judged to be a proven technology by the IPCC Special Report on Climate Change, with significant potential for both mitigation and adaptation, worldwide [1]. Kay et al [2] calculated that up to 235 Mt CO_2e/yr could be delivered from 10% of the EU land estimated to be under "high environmental pressure". Aertsens et al [3] went further, and estimated a technical sequestration potential for agroforestry (assuming around 10% tree cover) in the EU of 1.5 billion tonnes of CO_2e yr^{-1}. However, much lower estimates of the sequestration potential are sometimes given, for example, early drafts of the Commission's 2018 publication titled "A Clean Planet for All" [4,5], and included an EU agroforestry estimate [6] of only 0.138 t C/ha/yr or 0.63 Mt CO_2e per year (Table 1). The original source of this data [7] indicated that it excluded tree-biomass and refers exclusively to SOC, but it illustrates the difficulty of summarising comparable data from a range of studies when with different methodologies.

Land Use Practice	MT CO2 eq potential	Reference
Catch crops	9.7	A,C,E
Zero tillage	19.9	A,B,C,D,E
Reduced tillage	9.6	A,B,C,D,E
Residue incorporation	8.5	A,B,D
Residue management - composting	1.8	A,B,D
Rotation species, improved rotations	7.7	A,B
Adding legumes	10.6	A,E
Agroforestry	**0.63**	**A,C,E**
Grass in orchards and vineyards	1.8	A
Set aside	2.4	B,D
Perennial crops, deep rooting crops	4.5	B,D
Organic Farming	3.5	B,D
Hedgerows	?	C,E

Table 1: Difficulties of obtaining reliable information on sequestration rates in agroforestry. This table appeared in a draft version of "A Clean Planet for all - a European Strategic Long-Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy" [9], but excluded tree-biomass for agroforestry. Sources: A [34]; B [35]; C [8]; D [36]; E [37].

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Agroforestry data are particularly difficult and time-consuming to obtain (Figure 1), and allometric equations for European trees are biased towards narrow spacings with less below-ground biomass [8]. A useful rule of thumb is that individual agroforestry trees have around 3 times the total biomass of forest trees of the same age [9].

Figure1 *Measurements of C fluxes in agroforestry systems required estimating the full leaf biomass by wrapping the trees in nets (Restinclières experimental Estate, France) or measuring fine root turn-over by excavation or minirhizotrons (Photos Christian Dupraz).*

Several estimates of sequestration in agroforestry are available from the tropics and North America [10–17], although there is often inconsistency over the methodology used [18]. (A few) Long-term trials also exist in Europe, and often show higher sequestration than in crop/grass monocultures, sometimes approaching levels seen in forest plantations when grassland and tree production are considered together (Table 2).

Table 2*: Measured carbon storage potential in agroforestry systems in three agroclimatic regions in Europe and Canada / USA a) considering root biomass and b) not considering root biomass. (full data)*

		Measured carbon storage potential (t C ha⁻¹ yr⁻¹)								Mean	References
		Atlantic		Continental		Mediterranean		Canada / USA			
		Roots	No roots	Roots	No roots	Roots	No roots	Roots	No roots		
Hedge			1.21							**1.21**	[19,20]
Short rotation coppice (AF = 15% SRC on field)[21]					0.57		0.18			**0.32**	
	Paulownia						0.18			**0.18**	[21]
	Poplar				0.7					**0.7**	[22]
	Robinia				0.48					**0.48**	[23]
Silvoarable		4.9	0.51	1.09	0.33	0.88	1.93	1.34		**1.88**	
	Almond						0.04			**0.04**	[24]
	Conifer							1.16		**1.16**	[25,26]
	Fruit trees			1.92	0.44					**1.42**	[27,28]
	Nut trees	0.62			0.29	1.31		1.8		**0.66**	[26,29,30]
	Oak							0.8		**0.8**	[26]
	Olive					0.6				**0.6**	[31,32]
	Poplar	5.52	0.51	1.59			3.81	1.63		**3.29**	[25–27,33–35]
Silvopastoral		1.76			2.58		1.71	1.22	0.48	**1.78**	
	Conifer						0.21	1.22		**0.71**	[36,37]
	Fruit trees	1.76								**1.76**	[29]
	Nut trees								0.2	**0.2**	[29,38]
	Oak						0.15		0.75	**0.25**	[36,38], [39]
	Olive						0.39			**0.39**	[40]
	Poplar				2.58		5.68			**3.74**	[41,42]
Mean		**4.55**	**0.9**	**1.09**	**1.14**	**0.88**	**0.99**	**1.32**	**0.48**	**1.44**	

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Estimates of total C-sequestration potential in agroforestry in temperate regions vary between 1 and 12 t C ha-1 yr^{-1}, depending on species, climate, soil, management and rotation (Table 2). Aertsens et al. [3] assumed 2.75 t C ha-1 yr^{-1} and multiplied it by 90 M ha for the area in Europe with potential for productive silvoarable systems [43], and 50 M ha for potentially productive silvopasture. This gave an estimate of 486 Mt carbon yr^{-1} for potential C sequestration in new agroforestry, or 1.5 billion tonnes of CO_2e yr^{-1}. Aertsens et al [3] also calculated the economic value of carbon sequestration in agroforestry to be €282 ha^{-1}yr^{-1} in 2012 rising to €1007 ha^{-1}yr^{-1} in 2030 (assuming an increase in the price of a tonne to carbon of 100€).

An INRAE study in France [44] examined the costs and profitability of 10 carbon-sequestration options[2], including agroforestry and tree planting in hedgerows. They assumed an annual sequestration of 1 t C ha^{-1}yr^{-1}, or 3.7 t CO_2e ha^{-1}yr^{-1} for agroforestry, and estimated the financial value of the crop and timber outputs. The introduction of agroforestry was found to be cost neutral compared with existing land uses, and contributed 1.5 Mt CO_2 equivalent net carbon sequestration per year in France by 2030. In cost terms, it was around the middle of the options considered.

Kay et al [2] used datasets of a range of environmental pressures relating to soil health, water quality, biodiversity underprovision, and predicted temperature rise. Then they overlayed maps of these indicators at the 100 metre pixel scale to identify land under greatest environmental pressure and used expert opinions and literature data (sequestration potential between 0.09 and 7.29 t C ha^{-1}yr^{-1}) to estimate the carbon sequestration potential of agroforestry. They assumed that agroforestry could be implemented on 10% of the land (pixels) under greatest environmental risk and derived a sequestration potential of up to 234.8 million t CO_2e yr^{-1}. More recently, EURAF Policy Briefing #26 overlaid Corine 100m pixel resolution maps of EU cropland and grassland with 2018 Copernicus estimates of tree-crown-cover, to show that 169 million ha of EU-27 cropland/grassland[3] has 0% tree cover, with 171 million ha having less than 1% and 194 million ha less than 10% tree cover. Only 20% of the European cropland and grassland area has more than 10% tree cover.

Using this data, EURAF, in a recent press release, following publication of the "communication on Europe's 2040 climate target", suggested that …

"parklands, hedges, tree-lines and copses are needed throughout Europe, and most urgently on mineral soils which are afflicted by erosion and low soil fertility. Agroforestry planting on these lands will provide timber and soil carbon, together with biodiversity and environmental services. EURAF calculates that there are 95.2 million hectares of cropland and pastureland in the EU-27 that are devoid of trees, and 117.9 million hectares with less than 10% tree-crown-cover. Bringing these areas to the 10% tree-crown-cover threshold would mean planting 11.2 million ha of agroforestry"

And

"achieving the 10% tree cover target on EU agricultural land by 2040 will require planting an average of 750,000 ha/yr, starting in 2025. That's ambitious, but the climate payback would be massive: assuming an average sequestration rate of 5 tCO2e/yr/ha for agroforestry on mineral soils, including both above and below ground sequestration, 11.2 million ha of agroforestry would give 56 Mt CO2e over the lifetime of the trees - which is typically 20-40 years".

But

"trees grow slowly, and very slowly initially. They take decades to reach their full sequestration potential. Any delay in getting the campaign to reach 750,000 ha of agroforestry planted every year will result in an almost exponential emissions penalty being paid by 2040. Member States must finalise their National Energy and Climate Plans by June 2024. That offers their last and best chance to revise their tree planting targets for the current CAP period".

Also

*"The EU Carbon Removal Certification Framework (ref) can be the catalyst needed for agroforestry to take off. Agroforestry carbon farming could be financed **sequentially** through CAP Ecoschemes (year 1 for planning and soil sampling), CAP Investment Measures (year 2 for establishment), CAP AEC Measures (years 3-5 for early maintenance). Subsequently, the agroforestry areas could be "adopted" into national voluntary or statutory carbon farming (year 6 onwards) but only IF the tree establishment in the first 5 years can be shown as satisfactory (compared to norms considering local pedoclimatic conditions). Recording of these tree lines (Result Indicator 17.4) and areas (Result Indicator 17.3) in the standard CAP Geospatial Aid Application (GAA) and Land Parcel Identification Systems (LPIS) would take place from year 1, and would meet most of the initial voluntary certification needs".*

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[2] 1. Reduced use of synthetic mineral fertilisers, 2. Increased proportion of leguminous crops, 3. no- till cropping practices; 4. more cover crops, **5. agroforestry and hedges;** 6. optimised grassland management; 7. Reduced methane production by cattle; 8. reduced amount of protein in the animal diets; 9. trapping CH4 produced by the fermentation of livestock manure; 10. reduced fossil fuel consumption.
[3] EEA-39 - Including EFTA members and EU Candidate States (inc. Turkey).

2. The EU Carbon Farming Policy and Publication Timeline

- **June 2015:** DGCLIMA publishes a consultation on "*Addressing greenhouse gas emissions from agriculture and LULUCF in the context of the 2030 EU Climate and Energy Framework*"[4]. The impact assessment ([ref](#)) offered three choices: a) LULUCF pillar (business as usual); b) Land Use pillar (i.e. agriculture and forestry with integrated targets and reporting); c) effort sharing (including LULUCF in potential future effort sharing decision). Most scientific organisations, including EURAF [45] strongly favoured Option B, but a majority of submissions selected Option A, and proposals for the first LULUCF Regulation were developed with LULUCF continuing as a separate pillar.
- **May 2018:** the LULUCF Regulation ([2018/841](#)) becomes law with Annex II providing "forest" definitions in each MS.
- **October 2019:** the first carbon-farming roundtable, organised by DGCLIMA and Ecologic, (9.10.2019) considers a [background study](#) by EcoLogic, COWI and IIEP on "Carbon farming schemes in Europe"([meeting link](#))
- **May 2020:** The Farm-to-Fork Strategy ([COM2020-381](#)) is published and contains commitment that "*the Commission will develop a regulatory framework for certifying carbon removals based on robust and transparent carbon accounting to monitor and verify the authenticity of carbon removals*".
- **July 2020:** A report is produced by COWI/Ecologic and IEEP titled "*Analytical support for the operationalisation of an EU Carbon Farming Initiative*" ([CLIMA.C.3/ETS/2018/007](#)) This reviewed worldwide experience with carbon-sequestration projects, and laid the basis for further studies of options for result-based carbon-farming schemes in the EU. It built on discussions and recommendations from in the first carbon-farming roundtable.
- **September 2020:** the Commission publishes a "Communication on Stepping up Europe's 2030 climate ambition" ([COM2020-562](#)), and commented that "*Over time, the Commission clearly sees merit in the creation of an Agriculture, Forestry and Land Use (AFOLU) sector with its own specific policy framework covering all emissions and removals of these sectors and **to become the first sector to deliver net zero greenhouse gas emissions**. Subsequently, this sector would generate carbon removals to balance remaining emissions in other sectors induced by a **robust carbon removal certification system***".
- **September 2020**: the second Carbon-farming Roundtable is held in Brussels on 23.-24.9.2020 ([Workshop II report](#)). It considered the COWI report published in July 2020 and focused mainly on carbon farming for peatlands, agroforestry, and regenerative agriculture. Discussions fed into preparation of a Technical Guidance Handbook (q.v.) by the same consultants. EURAF made a presentation on Agroforestry and Carbon Farming based on 30-years of experience in Northern Ireland ([McAdam 2021](#)).
- **January 2021:** a Technical Guidance Handbook is published by COWI/EcologicInstitute/IEEP on "*Setting up and implementing result-based carbon farming mechanisms in the EU*" ([CLIMA.C.3/ETU/2018/007](#)). This is a comprehensive guide to existing carbon-farming schemes in the EU, and to future options. Case studies are presented on 1) peatland restoration and rewetting, 2) agroforestry, 3) enhancing soil organic carbon in mineral soil, 4) livestock carbon audit, 5) managing soil organic carbon on grasslands.
- **April 2021:** a workshop is held on "*Gathering ideas on the next steps for carbon farming*" ([Workshop III report](#) 21.4.21)
- **May 2021:** a workshop is held on "*Carbon farming in CAP Strategic Plans*". Reviewing the contribution of the land use, land-use change and forestry sector to the Green Deal ([Workshop IV report](#))
- **June 2021:** an update of the European Climate Law ([2021/1119](#)) is published. This confirmed (as announced in the Farm to Fork Strategy) that "*the Commission will promote a new green business model to reward land managers for greenhouse gas emission reductions and carbon removals in the upcoming carbon farming initiative*".
- **July 2021:** the "Fit for 55 package" is published, containing the draft Forest Strategy 2030 ([COM(2021)572](#)) where "*Member States are encouraged to accelerate the rollout of carbon farming practices, for instance via eco-schemes on also **agroforestry** or rural development interventions*". It also contains proposals for revision to the LULUCF Regulation, including increased national 2030 targets.
- **July 2021:** a review is published for DGCLIMA on "The contribution of the land use, land-use change and forestry sector to the Green deal". ([10.2834/201100](#))
- **February 2021:** a study is published for DGCLIMA on "*Support for capacity building in Member States to implement Forest Reference Levels and improvements of greenhouse gas inventories as requested by the LULUCF Regulation*" ([ICF, AETHERF, IIASA](#))
- **October 2021:** the European Environment Bureau (EEB) publishes a report on "[Carbon farming for climate, nature and farmers](#)". It had 5 recommendations: a) ensure carbon delivers nature-based solutions, benefitting climate, biodiversity, and rural communities; b) set legally-binding targets on climate, nature, and soils.; c) establish mandatory baselines, monitoring systems, and safeguards; d) develop a coherent policy mix of effective incentives, mobilising private and public funding strategically; e) invest in the enabling factors for behavioural change: knowledge, culture, and infrastructure
- **November 2021:** A study on "[Carbon Farming - making agriculture fit for 2030](#)", is published by the Parliament ENVI Committee, with a chapter on "carbon farming options" containing sections on managing peatlands, agroforestry, maintaining and enhancing SOC on mineral soils, and nutrient management on croplands and grasslands.

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[4] https://climate.ec.europa.eu/system/files/2016-11/questionnaire_en.pdf

- **December 2021**: the Sustainable Carbon Cycles communication is published ([COM/2021/600 final](#)) and mentions five possible improved land management practices including *"**Agroforestry** and other forms of mixed farming combining woody vegetation (trees or shrubs) with crop and/or animal production systems on the same land"*;
- **June 2022:** EURAF publishes "*Agroforestry in the revised LULUCF Regulations*" ([Policy Briefing #17](#)) and contacted all MEPs urging them to retain the commitment to carbon neutrality in the land sector (AFOLU) as proposed in the Commission's original document.
- **April 2022:** Council adopts conclusions on carbon farming ([15045/21](#)), based on parts of the Sustainable Carbon Cycles communication. e.g. "*Agriculture and forestry contribute to the overall effort to reduce emissions, which must remain the primary focus of European Union's climate neutrality objective, and at the same time they are capable of absorbing and storing carbon through carbon pools (forests, forest soils and wood products, grasslands, **agroforestry**, agricultural soils, wetlands, etc.)"*
- **November 2022:** the Commission publishes the proposal for a regulation "*Establishing a Union Certification Framework for Carbon Removals, CRCF*" ([COM-2022-672](#))
- **December 2022.** EURAF publishes "*Agroforestry and the Carbon Removals Certification Framework*" ([EURAF Policy Briefing #20](#)) welcoming the draft CRCF, but stressing that voluntary certification is only part of the solution and that the aspiration target in the Sustainable Carbon Cycles Communication is crucial: viz, "*by 2028 every land manager should have access to verified emission and removal data"*. We emphasised the need for open access to national Land Parcel Identification System data to achieve this target.
- **March 2023**. EURAF publishes "*Agroforestry & Parliament's Report on Sustainable Carbon Cycles*" (EURAF [Policy Briefing #24](#)), welcoming Parliament's draft report and the mentions it makes of agroforestry and agroecology, but regretting that the opportunities had not been taken of stressing the importance of calculating more detailed emissions from the Land Sector in CAP Strategic Plans and revisions of National Energy and Climate Plans
- **April 2023:** Parliament adopts a resolution on "*Sustainable Carbon Cycles*" ([P9_TA(2023)0104](#)) which has three mentions of agroforestry, including: *".. the growing interest in carbon farming should be an opportunity for farmers to transform their business model and to better reward farmers who are engaging in a transition towards agro-ecological and sustainable agroforestry practices"*
- **June 2023:** EURAF publishes "*Agroforestry and the 2040 AFOLU net-zero target"*. ([EURAF Policy Briefing 26](#)), stressing that agroforestry is technologically and economically feasible on the 169 million ha of European[5] cropland and grassland which has zero tree cover.
- **November 2023**: the Commission publishes a "Proposal for a monitoring framework for resilient European forests" ([COM2023-728](#)) - partially with the intention of improving data from forestry related to GHG emissions.
- **December 2023:** EURAF publishes "*Agroforestry and the Sustainable Finance Initiative*" ([EURAF Policy Briefing #28](#))
- **January 2024:** EURAF publishes an updated version of "Monitoring trees outside the forest in the EU" ([EURAF Policy Briefing #15](#))- criticising the Commission's proposal to enforce a single definition of forests which contradicts the definitions contained in Annex II of the LULUCF Regulation.
- **February 2024:** Provisional agreement reached ([20.2.24](#)) on revisions to the CRCF
- **March 2024:** the Valencia Carbon Farming Summit is held ([programme](#))

3. Agroforestry and Certification of Carbon Removals and Reductions

EURAF welcomed the Commission's communication on "Sustainable Carbon Cycles" in November 2021 (see [Policy Briefing #24](#)) and particularly recognition of the role of agroforestry and the description of the upcoming "Farm Sustainability Tool for Nutrients", viz:

- *"Although very site-dependent in application, the following are effective examples of improved land management practices that result in the increase of carbon sequestration and in most cases in co-benefits for ecosystems and biodiversity: a) **Afforestation and reforestation** that respect ecological principles favourable to biodiversity and enhanced sustainable forest management including biodiversity friendly practices and adaptation of forests to climate change; b) **Agroforestry and other forms of mixed farming** combining woody vegetation (trees or shrubs) with crop and/or animal production systems on the same land; c) **Use of catch crops, cover crops, conservation tillage and increasing landscape features**: protecting soils, reducing soil loss by erosion and enhancing soil organic carbon on degraded arable land; d) **Targeted conversion of cropland** to fallow or of set-aside areas to permanent grassland; e) **Restoration of peatlands and wetlands** that reduces oxidation of the existing carbon stock and increases the potential for carbon sequestration". (p5)*
- *"On-farm calculations will enable land managers – or their advisors – to access carbon farming schemes more easily, to assess carbon sequestration potentials of an individual land holding and to optimise*

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[5] EEA-39: Current list of EEA countries is [here](#) … effectively all of Europe with the exception of the UK.

*strategies. The reformed CAP includes the **Farm Sustainability Tool for nutrients** (FaST) – a digital application for farmers for sustainable management of nutrients. The Commission is working on the integration of a module for the calculation of GHG balance at holding level, complementing the assessment of the nutrient balance". (p10)*

EURAF has long advocated adding a farm-scale carbon balance module to the CAP Farm Sustainability Tool (FaST), and is working with colleagues in the Horizon Europe DigitAF Project to provide an open-source version of the JRC Carbon Calculator called the *Open Farm Carbon Tracker* (see EURAF GitHub site).

Publication of the proposal for a Regulation on the Union Certification Framework for Carbon Removals (CRCF-see EURAF Policy Briefing #20) is providing welcome impetus for carbon farming in Europe, and we are pleased that the proposals[6] have been revised to include non-CO2 gases from soils, and to develop future options for the certification of measures to reduce emissions from animals[7]. We are also pleased that the reference to agroforestry above was specifically included in the CFCR, along with other nature based solutions.

We welcome the intention of the Commission to draft certification processes before the end of 2024, through the Carbon Removals Expert Committee for: a) **soil carbon and agroforestry**, b) **rewetting of peatlands** and c) **sustainable forest management**, and we look forward helping the effort - particularly through work of the DigitAF project[8]. We point to the suggestions in EURAF Policy Briefing #28 ("Agroforestry and the Sustainable Finance Initiative"), developed by EURAF, ELO, ICRAF and PEFC, for a new Section (2.2) in Annex 1 of the Climate Delegated Act (2021/2139) of the Taxonomy Regulation (2020/852) on "Establishment and Regulation of Agroforestry". This outlined a range of technical screening criteria for agroforestry systems which are established or restored with the purpose of "*making a substantial contribution to climate mitigation*". Reference was also made to guidelines which EURAF and partners are drafting on meeting the requirements to "do no significant harm" in the areas of the following articles of the Taxonomy Regulation:
- Article 11 - climate change **adaptation**
- Article 12 - sustainable use and protection of **water and marine resources**
- Article 13 - transition to a **circular economy**
- Article 14 - **pollution** prevention and control
- Article 15 - protection and restoration of **biodiversity and ecosystems**

We also welcome frequent mentions in the CRFC provisional agreement (ref) of the need for conformity to methods developed in the LULUCF Regulation, in UNFCCC decisions and in IPCC reports and guidelines, and urge that the Implementing and Delegated Acts of the CRCF should adopt the thresholds in the definition of "forest land" in Annex 2 of the LULUCF Regulation (2018/841), and not the suggestion in the Forest Monitoring Regulation that all EU countries should adopt a single definition, irrespective of their national forestry laws or the international agreement contained in the 2001 UNFCCC Marrakesh Accords (ref). Harmonisation of approaches is needed, rather than strict standardisation. Accurate calculation of GHG emissions in LULUCF or CRCF will not be aided by two contradictory definitions of "forest" in 22 Member States (all except DK, FR, LU, IT and SE). It will also cause confusion over what constitutes "trees outside forests" (see EURAF Policy Briefing #15). The provisional agreement on the CRCF clarifies many questions raised in EURAF Policy Briefing #20, but three remain:
1. A "**standardised baseline**" is proposed to measure additional carbon removals and soil emission reductions, and this should be "*representative of the standard performance of comparable practices and processes in similar social, economic, environmental and technological circumstances and take into account the geographical context, including local pedo - climatic and regulatory conditions*". This is no mean task! We ask whether the data contained in national GSAA/LPIS systems can be used for this purpose - with continuing attempts to persuade MS to make this data available through their national **INSPIRE Directive Portals**?.
2. "*In the context of carbon farming, only practices and processes that go beyond the **common practice** should be certified. Therefore a specific carbon farming activity should not be rewarded if it is already*

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[6] https://data.consilium.europa.eu/doc/document/ST-7514-2024-INIT/en/pdf
[7] Presentation by Valaria Forlin (DGCLIMA) at the Carbon Farming Summit, Valencia March 2024.
[8] Presentation by Christian Holzleitner (DGCLIMA) at the Carbon Farming Summit, Valencia March 2024.

widely adopted within a region with similar pedo-climatic and regulatory conditions" The phrase "**common practice**" will be very difficult to quantify. We need to ensure that early adopters of carbon-farming practices are adequately recognised. This is another reason why detailed historical records recorded in the plot-scale GSAA/LPIS system need to be made available by MS.

3. We note that the issue of "**additionality**" is simplified by the use of "standardised baselines" and applies to activities which "do not need incentives to take place", but there remains uncertainty over whether voluntary carbon farming rules will apply to areas which have been in receipt of CAP incentives in the form of Eco Scheme or AECM payments.

4. Sharing of data for GHG reporting at local, regional and national scale

International interest in LULUCF is rising, and more than 100 countries have included LULUCF carbon sinks in their UNFCCC Intended Nationally Determined Contributions (INDCs) [46]. Carbon-sequestration by trees outside forests is starting to be included in national GHG emissions reporting, and in UNFCCC Annex 1 countries these reports are produced at an increasingly detailed scale. In the EU, for example, Member States are using the national LPIS developed to monitor entitlement to CAP as the basis of LULUCF reporting. The LPIS holds information on ownership and land use of all fields at a scale of 1:5000, and detailed modelling of emissions has the potential to provide individual farmers with estimates of their GHG emissions [47,48] and advice on how these emissions can be minimised.

The final draft CRCF stresses that "*standardised baselines should be reviewed every five years in light of evolving regulatory circumstances and of the latest available scientific evidence **to reflect the social, economic, environmental, regulatory and technological developments** and to encourage increased ambition over time ... and in addition to make use of available digital technologies, including electronic databases and geographic information systems, remote sensing, novel on -site carbon quantification systems, artificial intelligence and machine learning, and of electronic maps*".

Open access to a number of existing EU datasets is crucial, and these should be available at field and farm scale. This is particularly relevant to the EU GreenData4All initiative and the INSPIRE Directive, where the European Joint Research Center (JRC) considers that many Member States still have large improvements to make in providing access to open geospatial data [49]. The following data is particularly important to obtain at farm-scale.

CAP Indicators
- **PMEF Impact Indicators** [50], including I.21 for the area of landscape features (especially woody landscape features), I.29 Farmland Bird Index, I.15 gross nitrogen and phosphorus balance, I.11 SOC on organic land, I.13 soil erosion by water, I.14 ammonia emissions from agriculture
- **PMEF Result Indicators** [51], Including R.12 share of UAA under commitments to improved climate adaptation, R.14 share of UAA supported under commitments to reduce emissions of GHGs including manure, R.17 showing planted areas of afforestation (17.1), restoration (17.2), agroforestry (17.3) and woody landscape features (R17.4). R.19 share of USS under commitments to improved soil quality and biota, R.34 preserving landscape features
- **PMEF Output Indicators** [52] Including O.14 number of agricultural ha with environmental commitments, O15 number of forestry hectares with environment or climate related commitments, O16 number of agricultural hectares with maintenance commitments for afforestation or agroforestry, O.34 number of ha supported.
- **Land Parcel Identification System** (LPIS): a subset of the Integrated Administration and Control System (IACS) containing spatial information on reference parcels, crop types, land uses and stable ecological focus areas.
- **FaST Platform:** intended as a "world-leading platform for the generation and re-use of solutions for sustainable and competitive agriculture based on space data (Copernicus and Galileo) and other data public and private datasets". It is due for release by 2024 at the latest" (ref).

Copernicus datasets (CLMS portfolio)
- **Land Cover/ Land Use:** Global dynamic layer (100m), CORINE land cover (25ha), CORINE land cover change (5ha), CLC+ (100m)
- **Detailed thematic layers:** Dominant leaf type (20m), forest type (20m,100m), forest additional support (20m), grassland (20m, 100m), grassland ploughing (20m,100m), grassland veg probability (20m), imperviousness (20m, 100m), small woody features (5m, 100m), tree cover density (20m, 100m), water and wetness (20m, 100m)
- **Hot Spot Monitoring:** Natura 2000 (0.5ha), Riparian Zones (0.5ha), Riparian Zones - green elements (0.5ha), Riparian Zones - land cover and use (0.5ha)

Soil Datasets
- European Soil Database (1km, ref); Topsoil physical properties for Europe (ref); Database of EU Research projects in soils (ref); Topsoil organic carbon content for Europe (ref); Soil organic projects for Europe (ref).

5. Synergy between the CRCF and other EU Policies/Initiatives

1. **Biodiversity Strategy 2030** (COM/2020/380) emphasises legally binding protection targets for restoration of degraded ecosystems, with greatest potential to capture and store carbon.
2. **Bioeconomy Strategy 2030** (COM/2018/673) discusses a pilot programme on carbon farming to encourage Member States to establish a fund to buy carbon credits from farmers and forest owners who implement specific projects that aim at increasing soil and biomass carbon sequestration and/or reducing emissions in the livestock sector or that are related to fertiliser use.
3. **Carbon border adjustment mechanism** (PE/7/2023/REV/1) aims to ensure that imports have paid a price for the carbon emissions produced during their manufacturing. This makes the carbon cost of imports comparable to domestic production, safeguarding the EU's climate goals. It will apply to specific goods like cement, iron and steel, aluminium, fertilisers, electricity, and hydrogen – industries that have high carbon emissions and are at risk of carbon leakage.
4. **Deforestation Regulation** (PE/82/2022/REV/1) comes into action on 30/12/2024. It imposes strict rules in terms of due diligence to all companies wishing to place affected products on the European market, or to export them. Products must be deforestation-free, produced in accordance with relevant local legislation, and covered by a due diligence statement (with geospatial location information). Products covered are: cattle, cocoa, coffee, oil palm, soya, wood, and rubber.
5. **Directive on Soil Monitoring and Resilience** (proposal - COM2023-415) requires the creation of "soil districts" throughout the territory of Member States. Soil districts should "*constitute the basic governance units to manage soils and to take measures to comply with the requirements laid down in this Directive, in particular with regard to the monitoring and assessment of soil health*" **BUT** the Directive indicates that there need not be more "districts" than the number of NUTS1 units, of which there are 92 in the EU. This is far too coarse a spatial division to be of use to the CRCF. The Directive experts MS to implement an enhanced LUCAS topsoil monitoring programme and to integrate with national databases of soil properties.
6. **Directive on the Substantiation and Communication of Explicit Environmental Claims** (Green Claims Directive) (COM/2023/166). Will require companies to substantiate the voluntary green claims they make in business-to-consumer commercial practices, by complying with a number of requirements regarding their assessment (e.g. taking a life-cycle perspective). It reports that methodologies underpinning emissions-offsets vary widely and are not always transparent, accurate, or consistent.
7. **EU Climate Law** places a requirement on Member States to update their **National Energy and Climate Plans** every 3 years. The June 2023 update was late for most MS, and still missing for PL and AT. DGCLIMA issued comprehensive guidance on "improving the contribution of land-use, forestry and agriculture to enhance climate, energy and environment ambition" (May 2023), with many mentions of agroforestry and carbon farming.
8. **Forest Monitoring Regulation** (COM/2023/728) This proposal will improve the monitoring of carbon farming schemes based on afforestation and sustainable management. The indicators suggested in the FMR (Annex I) are a) forest area, b) tree cover density, c) forest type, d) forest connectivity, e) defoliation, f) forest fires (events, burnt-areas, severity, post-fire erosion, post-fire recovery) g) wildfire risk assessment, h) tree cover disturbances. In Annex II the indices are: a) forest available for wood supply or not available for wood supply; b) growing stock volume per ha; c) net annual increment per ha; d) stand structure; e) tree species composition and richness; f) European Forest Type; g) removals; h) deadwood; f) location of forest habitats in Natura 2000 sites; j) abundance of common forest birds; k) location of primary and old-growth forests; l) protected forest areas; protected forest areas; m) production and trade of wood products; n) forest biomass for bioenergy
9. **Forest Strategy for 2030** (COM/2021/572) mentions "promotion of forest-related remuneration schemes in an action plan for both carbon farming and carbon removal certification by the end of 2021". It also "*encourages Member states to accelerate the rollout of carbon farming practices, for instance via eco-schemes on agroforestry or rural development interventions*".
10. **Framework for Sustainable Investment** (2020/852). Informs investors on whether an economic activity is environmentally sustainable by setting common EU-wide criteria. The Delegated Acts for Climate (2021/2139) and Environment (2021/2178) are important - as is the EU Taxonomy Navigator.
11. **GreenData4All Initiative** will help deliver on Europe's green and digital transformation by updating EU rules on environmental geospatial data and on public access to environmental information. The aim is to: enable greater sharing of data between the public & private sectors and with the general public, unlock the full benefits of data sharing for data-driven innovation and evidence-based decisions. It is very relevant to the sharing of soils and land-use information needed in the CRCF.
12. **Guidelines on Biodiversity-Friendly Afforestation, Reforestation and Tree Planting** (March 2023) provides a set of practical recommendations to support authorities, forest and landowners, and managers and civil society to better implement biodiversity-friendly afforestation, reforestation and tree-planting projects at the local level.
13. **LULUCF Regulation** (2018/841) was updated in 2023. Rules for monitoring emissions and removals on agricultural land (only non CO2) and forests and land use change. It also defines "forest land"

14. **Nature Restoration Regulation** (final compromise text) is important a) because of the obligation it places on Member States to monitor High Diversity Landscape Features and to ensure that these increase in area to a target set by MS themselves, b) because National Restoration Plans may include specific measures to restore woody vegetation in agricultural and degraded forest areas.
15. **Renewable Energy Directive III** (2023/2413). This proposal sets sustainability criteria for bioenergy - for either national authorities or private certification to assess. It specifically mentions strong links to carbon removal certification
16. **Strategy on Adaptation to Climate Change** (COM/2021/82) indicates that the Commission will a) propose nature-based solutions for carbon removals, including accounting and certification in upcoming carbon farming initiatives; b) develop the financial aspects of nature-based solutions and foster the development of financial approaches and products that also cover nature-based adaptation; c) continue to incentivise and assist Member States to rollout nature-based solutions through assessments, guidance, capacity building, and EU funding.

6 Looking further forward

The Sustainable Carbon Cycles Communication (COM/2021/600 final) gave an **aspirational target** that "*by 2028 every land manager should have access to verified emission and removal data*". The CRCF will go only part way to achieving this, since voluntary carbon markets have costs and complications which will restrict their appeal and scope. Opening the prospect of carbon farming to "every land manager" will require implementation of a statutory agricultural Emission Trading Scheme (the "agri-ETS")[9]. A preliminary study on this has already been commissioned and published by DGCLIMA [53].

The agri-ETS would be a certification mechanism for "polluting industries", including in the agricultural sector, to buy emission allowances on a regulated carbon market. Integration between farm-scale carbon emissions and national GHG emission reporting could then be possible, but would be predicated on detailed **spatial emissions calculation** at national level, for example by:
- Member States using IPCC Tier 3 (modelling) and Approach 3 (geospatial identification of parcels) methods in the calculation of national GHG emissions (AFOLU/LULUCF reporting), and provide **open access** to the datasets used in these calculations: so that farmers - and their advisors - can use similar methodologies to calculate farm-scale emissions.
- Member States developing a time-series of **sequential carbon farming support**, starting with support for planning and soil sampling (through Ecoschemes), establishment (Pillar II-Investment support) continued maintenance in initial years (through Pillar II AECM) and longer term monetization - through voluntary schemes based on robust certification and/or the option of including forestry projects in a "third" EU ETS [54,55].

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[9] Better called an "AFOLU-ETS" since this is the name given by UNFCCC for the whole "land-sector", integrating all of "Agriculture, Forestry and Other Land Use".

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