

Can agroforestry help the EU achieve net zero in the land sector by 2040?

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Introduction

Agroforestry systems cover around 15.1 million ha in the EU in 2012 or about 8.8% of the Utilised Agricultural Area (UAA). Recent flexibility given to Member States in their definitions of “permanent grassland”, allows inclusion of grazable-shrubs, and the area of trees and shrubs in agricultural use may be greater [1]. Agroforestry and sustainable management of soils are prime candidates for certification under the draft EU Carbon Removal Certification Framework (CRCF) [2] and the Sustainable Finance Initiative [3], and it seems to meet all the “sustainability” co-benefits of the CRCF: viz, climate mitigation [4], carbon adaptation [5], sustainable use of water resources, transition to a circular economy, pollution prevention and control, protection and restoration of biodiversity and ecosystems. But what is its potential contribution to EU emission reduction targets? And is there sufficient available land for a large programme of afforestation and agroforestation?

Objectives / research questions

The revised EU Land Use, Land Use Change and Forestry Regulation (LULUCF - 2023/839) entered into force in May 2023. It set a collective GHG reduction target for LULUCF for Member States of -310 Mt CO₂e/yr by 2030, and almost all Member States will find the targets extremely difficult to achieve - because of increasing pressures on forests through, disease, fire ageing-structures and increased exploitation. Sequestration is estimated to have been around 212 MtCO₂e in 2022, and the most recent evaluation by the Commission of Member States’ commitments to increase this [6] concludes that the EU is on track to miss the LULUCF target of 310 Mt CO₂e by around 40-50 Mt/yr in 2030. Given the time that trees take to grow, we asked the question: how much contribution to the 2030 targets could an emergency programme of afforestation and agroforestation make to closing the LULUCF shortfall by 2030. In addition, we ask whether it will be possible to achieve overall GHG neutrality in the Agriculture, Forestry and Other Land Use sector (AFOLU) by 2040, given that the current annual emission of non-CO₂ gases from agriculture is around 380 MtCO₂e?

Methodology

As part of an update of EURAF Policy Briefing #8 on Carbon Farming [7] we reviewed the literature on sequestration of agroforestry systems in temperate regions and used 2018 Copernicus data on tree crown density superimposed on Coring estimates of agricultural land cover to evaluate the scope for very-large scale afforestation and agroforestation: focusing on those areas in Member States which have fewest trees. These are usually the areas of greatest environmental pressure [8], where the mineral soils stand to benefit most from the introduction of small forest-blocks, agroforestry and landscape features.

Results

Around 27 studies reported reliably on temperate agroforestry sequestration data (6 Atlantic, 7 Continental, 12 Mediterranean, 4 Canada/USA). Some of them recorded whole system biomass and carbon stocks, others evaluated the annual prunings and residues. Several combined measured and modelled data, to account for the whole lifespan of an agroforestry system – from planting to harvesting. The average agroforestry system captured around 1.44 t C/ha/yr or 5.27 t CO₂/ha/yr aboveground. Systems ranged from 0.15-0.90 t C/ha/year in Mediterranean oak in Dehesa or Montado systems to 5 t C/ha/year in dense poplar agroforestry systems in the UK.

Excluding Natura 2000 areas, we concluded that more than 77% of EU agricultural land (~130 Mha) has less than 10% tree crown cover and almost 60% has zero tree cover (~100 Mha). Therefore, there seems to be an excellent opportunity to increase tree-cover on all agricultural land to 10%, by introducing an

emergency programme of small-scale afforestation and agroforestation (Figure 1). The latter has the advantage of keeping land in “official” agricultural use and retaining eligibility for agricultural basic payments. If an average total (above- and below-ground) sequestration of 5 tCO₂e/ha/yr is assumed for the EU, an emergency tree-planting programme of 1 million hectares per year, starting in 2025, would generate around 80 Mt CO₂e/yr by 2040. This will go a long way to filling the estimated annual net-emissions gap in the land sector (AFOLU) in 2040 of 110-120 Mt CO₂e. It assumes, however, a scale of tree-planting completely without precedent in Member States. The currently proposed planting area in CAP Strategic Plans over the seven-year period from 2023-2029 is only 0.619 million hectares.

Conclusion

An additional 80 MtCO₂e/yr of LULUCF sequestration in the EU could be captured by 2040 through an emergency afforestation and agroforestation programme of 1 million ha/yr from 2025 onwards. This would greatly contribute to achieving net-zero in the land sector (AFOLU) by 2040, but this scale of planting is approximately ten times bigger than that currently included in the CAP Strategic Plans and Forest Plans of Member States.

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Keywords

agricultural policy, carbon sequestration, Agroforestry, Agroforestry certification, climate mitigation

Additional Attachment I.

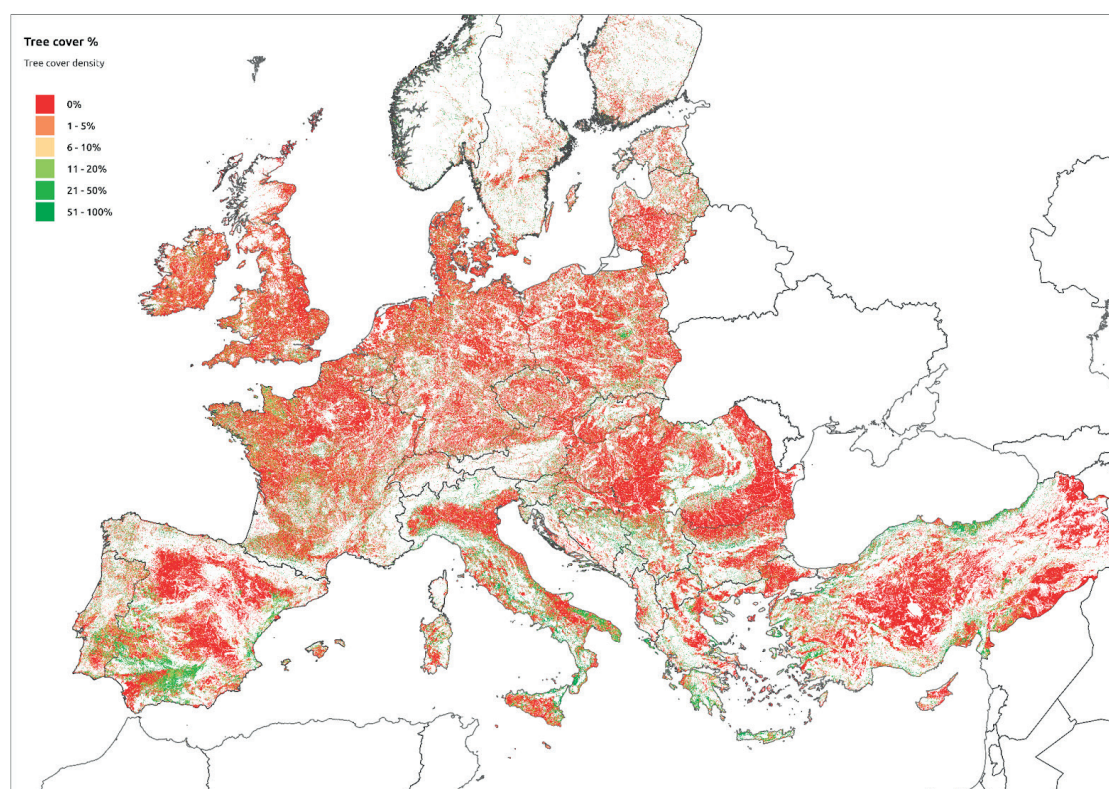


Figure 1. Tree cover density (% tree cover in 100 m pixels) in agricultural land in the 39 EEA countries. The red areas are priority planting areas where tree cover density is particularly low. Source: Copernicus tree cover density 2018 superimposed on CORINE agricultural land 2018. Each pixel in this map covers 1ha.

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