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# Carbon balance estimation for Agroforestry land use alternatives in Portugal

Crous-Duran J. \*, Paulo J.A, Palma J.H.N

jcrous@isa.ulisboa.pt

ForChange -Forest Ecosystem Management under Global Change, Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade de Lisboa, Portugal

**Why?** Because of the new policies established by the EU supporting the conversion of land into low-carbon integrated agriculture such as agroforestry.

**What?** Compare the potential capacity of the *montado* (typical portuguese agroforestry system) to mitigate the Green House Gas emissions in comparison to two other land-use alternatives: dense cork oak forestry and a conventional rotation of wheat monoculture.

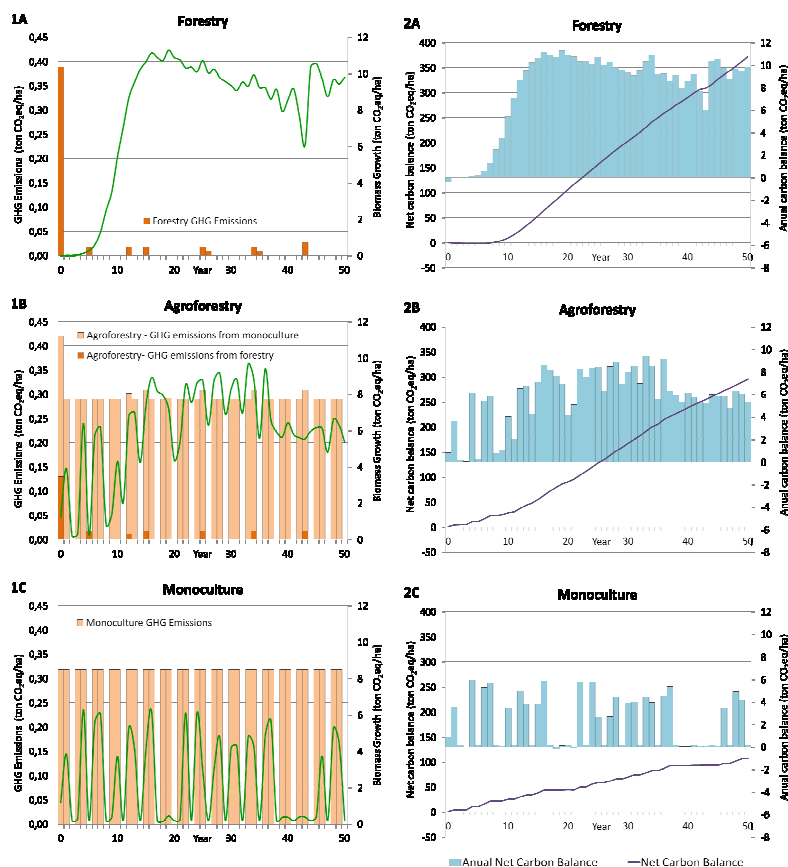
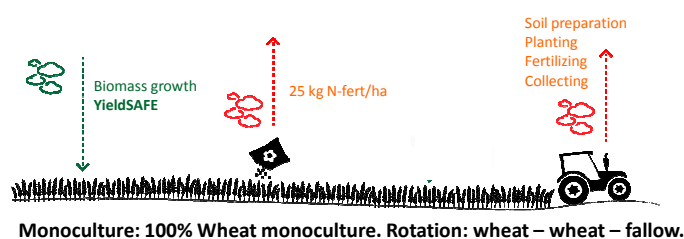
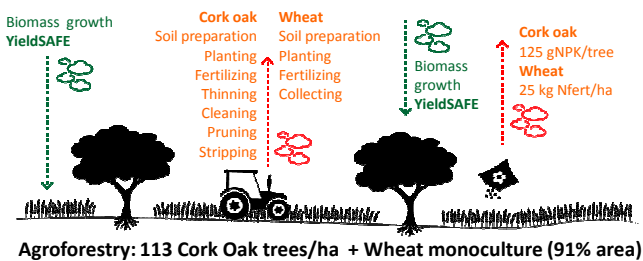
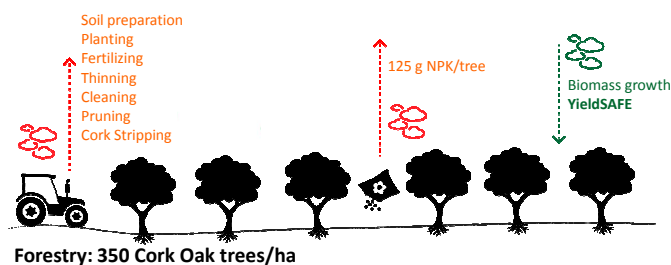
**Where?** In Portugal, where 350,000 ha could be available for the implementation of the *montado* (Palma et al. 2014).

**How?** Quantifying the net carbon balance of the three alternatives for a simulated period of 50 years.



## Methodology and Materials

$$\text{Net Carbon Balance (NCB)} = \sum \text{CO}_2 \text{ sequestered} - \sum \text{CO}_2 \text{ emitted}$$



**Figure 1.** Average biomass growth estimated using YieldSAFE (van der Werf et al. 2007) and GHG emissions from field operations and fertilizers for forestry (A), agroforestry (B) and monoculture (C).

**Figure 2.** Net carbon balance (Cumulative carbon sequestered) and Annual carbon balance (Annual carbon sequestered) for forestry (A), agroforestry (B) and monoculture (C).

## Conclusions

-The preliminary modeling results support the EU policies promoting the implementation of agroforestry systems in Europe as a measure to mitigate the GHG emissions and their effect on Climate Change.

-The agroforestry system, in this case the *montado*, presents a high net capacity of sequestering carbon while offers a wider set of products and environmental services.

-Around 6 tons of CO<sub>2</sub>eq/ha could be reduced every year by implementing *montado* systems.

-In a future, the emissions originated from the soil compartment and from the production of fuels will be included as it has been seen to be two important GHG sources (Rajaniemi et al. 2011).

## References

- Palma et al. 2014. 3<sup>rd</sup> World Congress of Agroforestry, New Delhi, India..  
 Rajaniemi et al 2011. Agronomy Research Biosystem Engineering Special Issue 1, 189-195, 2011  
 van der Werf et al. 2007. Ecological Engineering, 29: 419-433.

We acknowledge the support of the European Union through the AGFORWARD FP7 research project (contract 613520) and the Portuguese Foundation for Science and Technology (FCT) through the project CorkCarbon Footprint (PTDC/AGR-FOR/4360/2012).