

Optimizing agroforestry systems for climate change mitigation: A detailed analysis of common walnut (*Juglans regia* L.) and wild cherry (*Prunus avium* L.) trees



Christopher Morhart^{1*}, Jonathan P. Sheppard¹, Thomas Seifert¹, Zoe Schindler¹

¹ University of Freiburg, Chair of Forest Growth and Dendroecology, Freiburg, Germany
² * Contact: christopher.morhart@wwd.uni-freiburg.de

Background

Agroforestry systems (AFS), the combination of trees and agricultural production, are widely recognised for their potential to provide a multitude of ecosystem services. Furthermore, AFS are increasingly regarded as a crucial strategy for both mitigating and adapting to climate change. Despite these benefits, there is a notable gap in knowledge in terms of individual tree characteristics.

Our goal was to collect important structural information about common walnut (*Juglans regia* L.) and wild cherry (*Prunus avium* L.) trees and, based on this, to determine the carbon storage potential of entire agroforestry systems.

Materials & Methods

Sampled trees:

- Common walnut: 65 trees with a diameter at breast height (DBH) from 1 to 77 cm DBH
- Wild cherry: 70 trees with a DBH from 1 to 50 cm

Method:

- Terrestrial laser scanner (RIEGL VZ-400i) for the collection of 3D data
- 3D models were used to calculate: DBH, tree height, crown projection area, **above-ground biomass (AGB)**, and **above-ground carbon (AGC)**

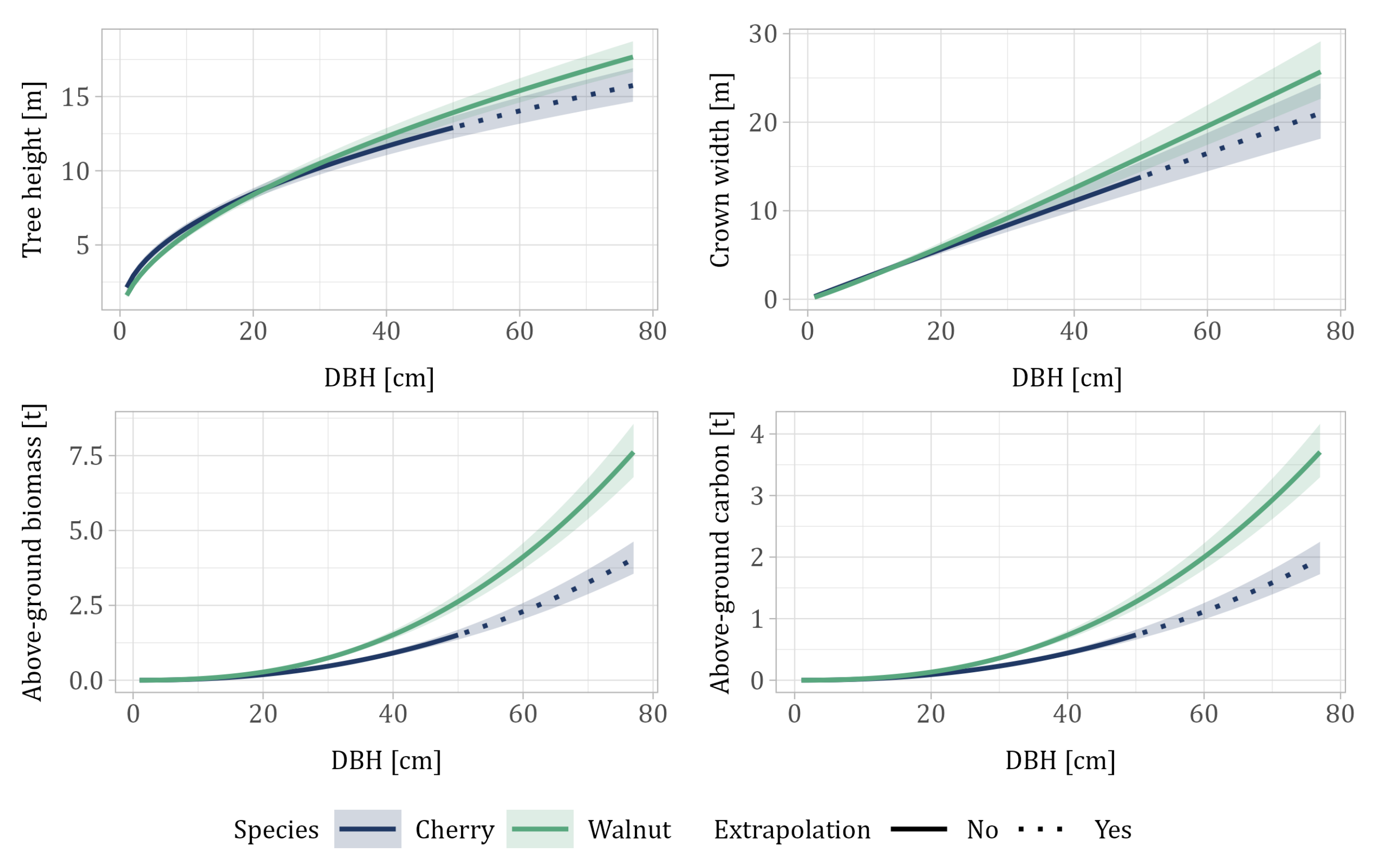


Results

We were able to develop models for cherry and walnut grown in AFS for tree height, crown width, AGB and AGC:

Exemplary comparison: AGC

- Walnut tree (50cm DBH): 1,273kg
- Cherry tree (50cm DBH): 735kg

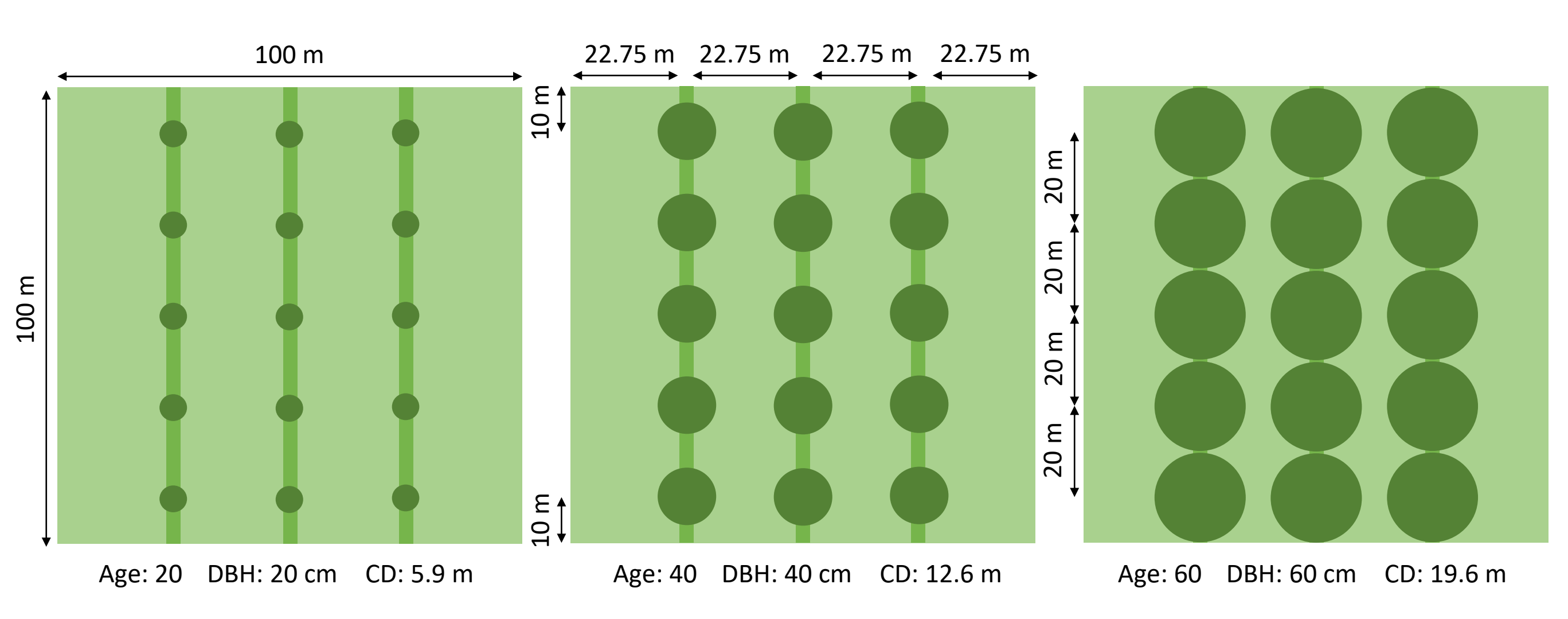


Discussion

- The developed crown width models help to plan and design AFS
- **High potential for AGC storage in AFS with cherry and walnut**

AFS design example with walnut trees:

- 15 trees per hectare, each with a target DBH of 60cm at age 60
- ~60 tonnes of AGB per hectare for the entire AFS
- ~30 tonnes of AGC per hectare for the entire AFS



References

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- Schindler, Z., Seifert, T., Sheppard, J.P., Morhart, C. (2023) Allometric models for above-ground biomass, carbon and nutrient content of wild cherry (*Prunus avium* L.) trees in agroforestry systems. *Annals of Forest Science* 80, 28

Funding

With support from
Federal Ministry of Agriculture, Food and Regional Identity
by decision of the German Bundestag

Project manager
Federal Office for Agriculture and Food

The HUMAX project is supported by funds of the Federal Ministry of Agriculture, Food and Regional Identity (BMLEH) based on a decision of the Parliament of the Federal Republic of Germany via the Federal Office for Agriculture and Food (BLE) under the Climate protection measure Humus, grant number 2822HUM010.

