

# Above-ground biomass carbon stocks and annual sequestration rates of a poplar silvoarable system

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## Introduction

- Agroforestry practices are widely encouraged for climate change mitigation and there is an urgent need to assess their contribution to national ‘net-zero’ targets.
- However, poplar silvoarable systems can efficiently sequester more C in agriculture land.
- The aim of this study was to determine the above-ground biomass (AGB) carbon (C) stock and annual C sequestration rate for four poplar hybrids planted in 1992 at a density of 166 trees per hectare in a silvoarable agroforestry systems.

## Result

Table 1. Annual C sequestration rate over 30 years

| Poplar hybrids   | Average C stock per species in year 2022 (t C/ha) | Average annual C sequestration rate (t C/ha/yr) |
|------------------|---|---|
| <i>Robusta</i>   | 38.69   | 1.28  |
| <i>Beaupre</i>   | 40.31   | 1.34  |
| <i>Trichobel</i> | 63.44   | 2.11  |
| <i>Gibecq</i>    | 32.54   | 1.08  |

The AGB C stock was significantly different between hybrids (Fig 1) and by 2022 Trichobel had the greatest mean AGB C stock (63.44 t C/ha/yr) and Gibecq the lowest AGB C stock (32.54 t C/ha) (Table 1).

Over the 30 year period, the average annual C sequestration rate by AGB varied between poplar hybrids (Table 1). However, Figure 2 shows that annual rates of C sequestration varied greatly over time for all hybrids.

## Methods

A species-specific allometric equation was used to calculate AGB using 30 years of diameter at breast height (dbh) measurements and converted to AGB C stock by assuming a C content of 50%.

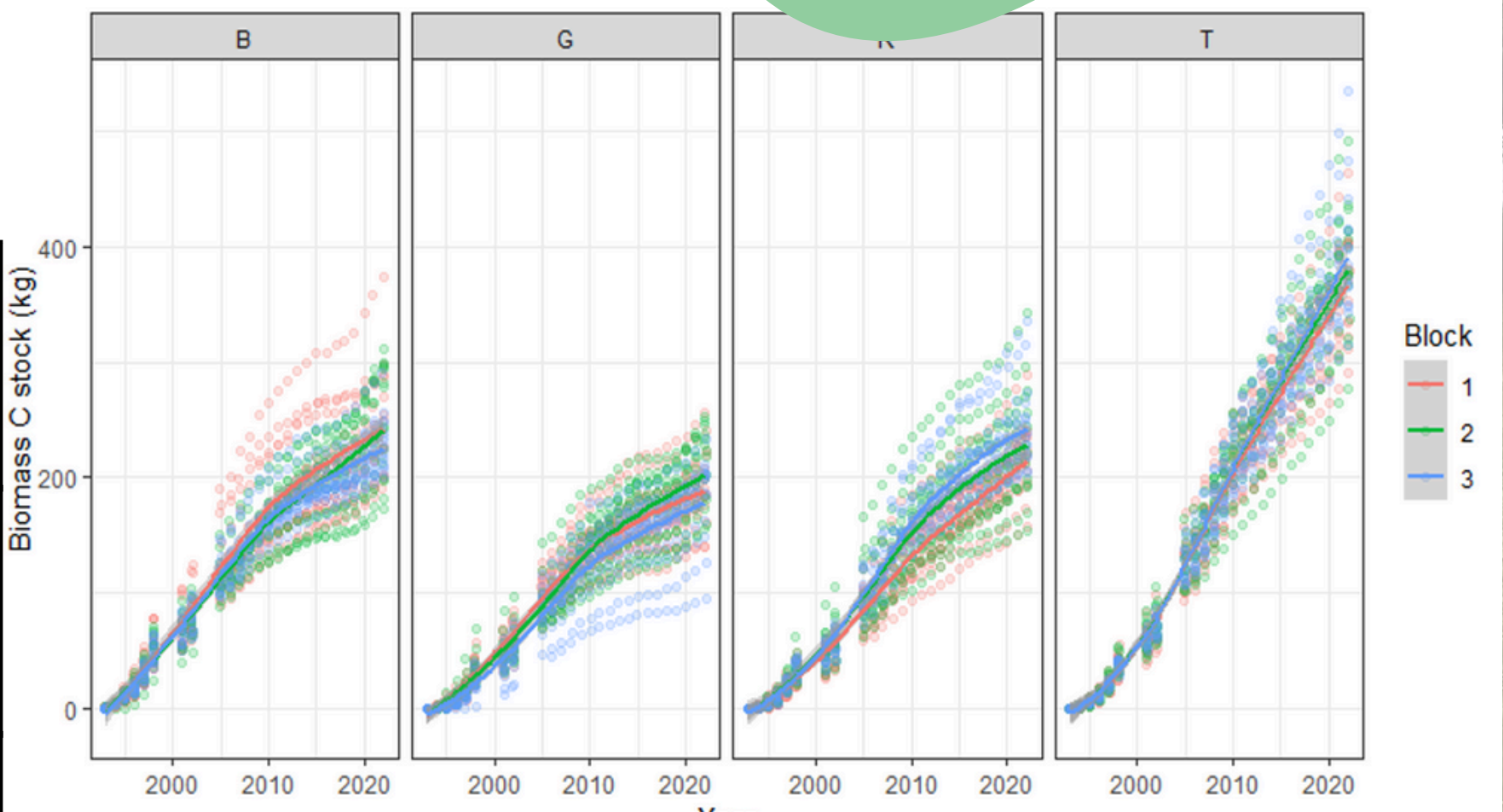


Fig 1. Biomass average C stock per species (kg/year)

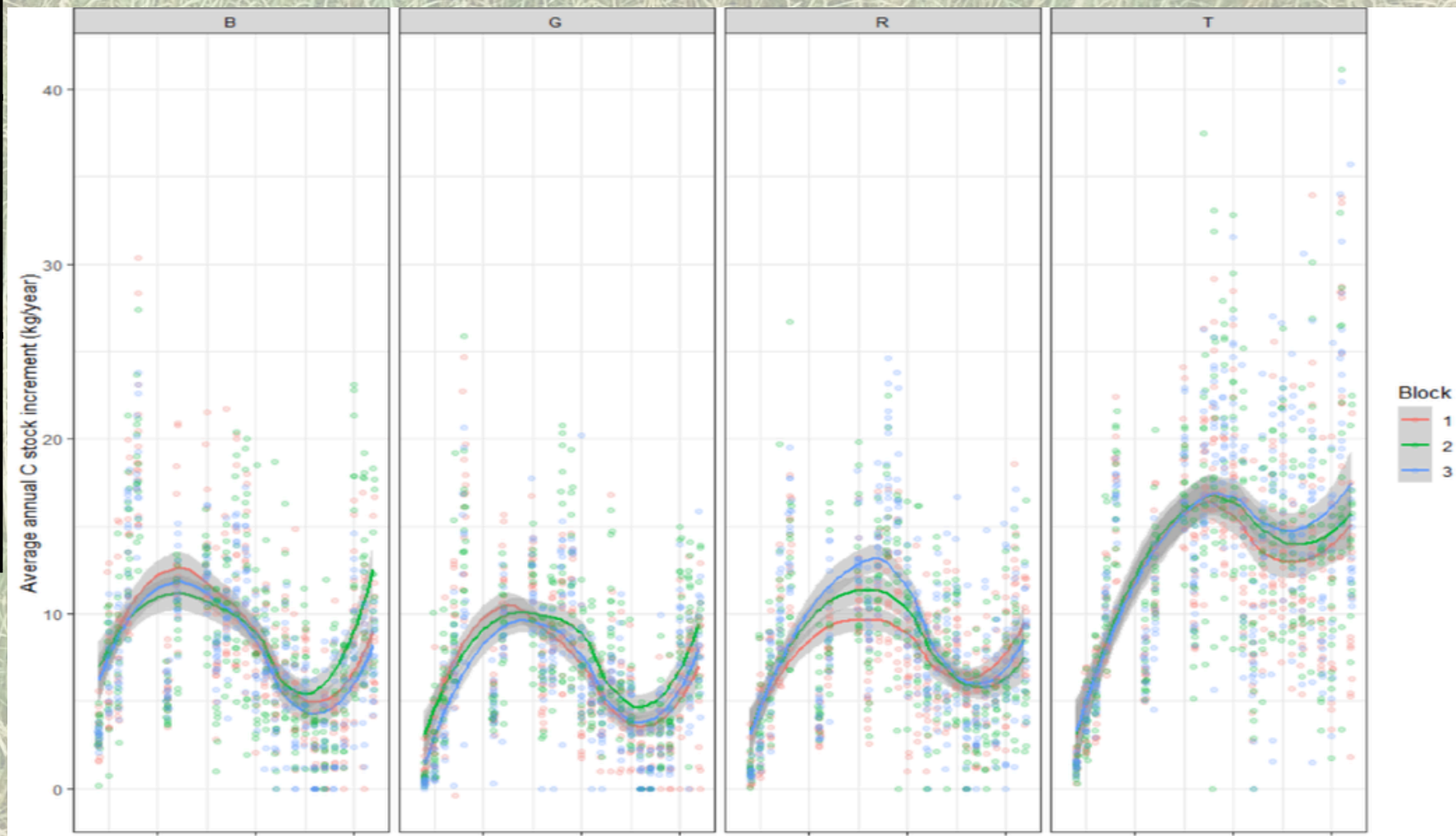


Fig.2. Average C increment per species (kg/year)

Our results are on the low side of the estimated annual C sequestration rate of agroforestry in temperate zones by the European Agroforestry Federation of 1- 4 tonnes C/yr/ha for trees planted at a density of 50-100 trees/ha.

Future research will explore the impact of variation in annual rainfall and temperature on annual C sequestration rates.

## Discussion