University of Copenhagen(UCPH)

36,897
students

9,982
employees of whom 5,311 are researchers

13,389
research publications

6th
best university in Europe

9.4
billion DKK in revenue

938,093
square metres floor area

Coordinates

@ Faculty of science
@ Department of Plant and Environmental Sciences
@ Crop Science
@ Climate and Food Security research group (6 people)
@ National and EU projects
- ✓ FOODSHIFT2030
- ✓ MUSHNOMICS
- ✓ GOHYDRO
- ✓ ECOTWINS
- ✓ REFOREST

Key staff participating

Bhim Bahadur Ghaley (PhD) Associate Professor at Department of Plant and Environmental Sciences, University of Copenhagen. ORCID Id https://orcid.org/0000-0002-0864-7613

Bhim Bahadur Ghaley has a background in molecular plant breeding and agronomy. Ghaley has extensive experience working on agroforestry systems from Europe (Germany, United Kingdom, Poland, Romania and Italy) and working with smallholder farmers in Asia (Bhutan) and North Africa (Tunisia and Egypt). My research areas cover intercropping/mixed cropping, field trial execution, agronomy/field crop production, nutrient uptake and utilization, 15N stable isotope use, cultivar screening for pest and disease, molecular plant breeding, crop and soil process modelling, soil carbon and nitrogen dynamics, ecosystem service quantification and valuation, ecological stoichiometry, value chain analysis, emergy synthesis and multivariate modelling in ArcGIS.

Material resources

Department of Plant and Environmental Sciences is equipped with advance state-of-the-art laboratory, greenhouse and experimental farms to carry out the field and laboratory work for the project and to host the PhD students to meet their laboratory equipment and field trial needs.

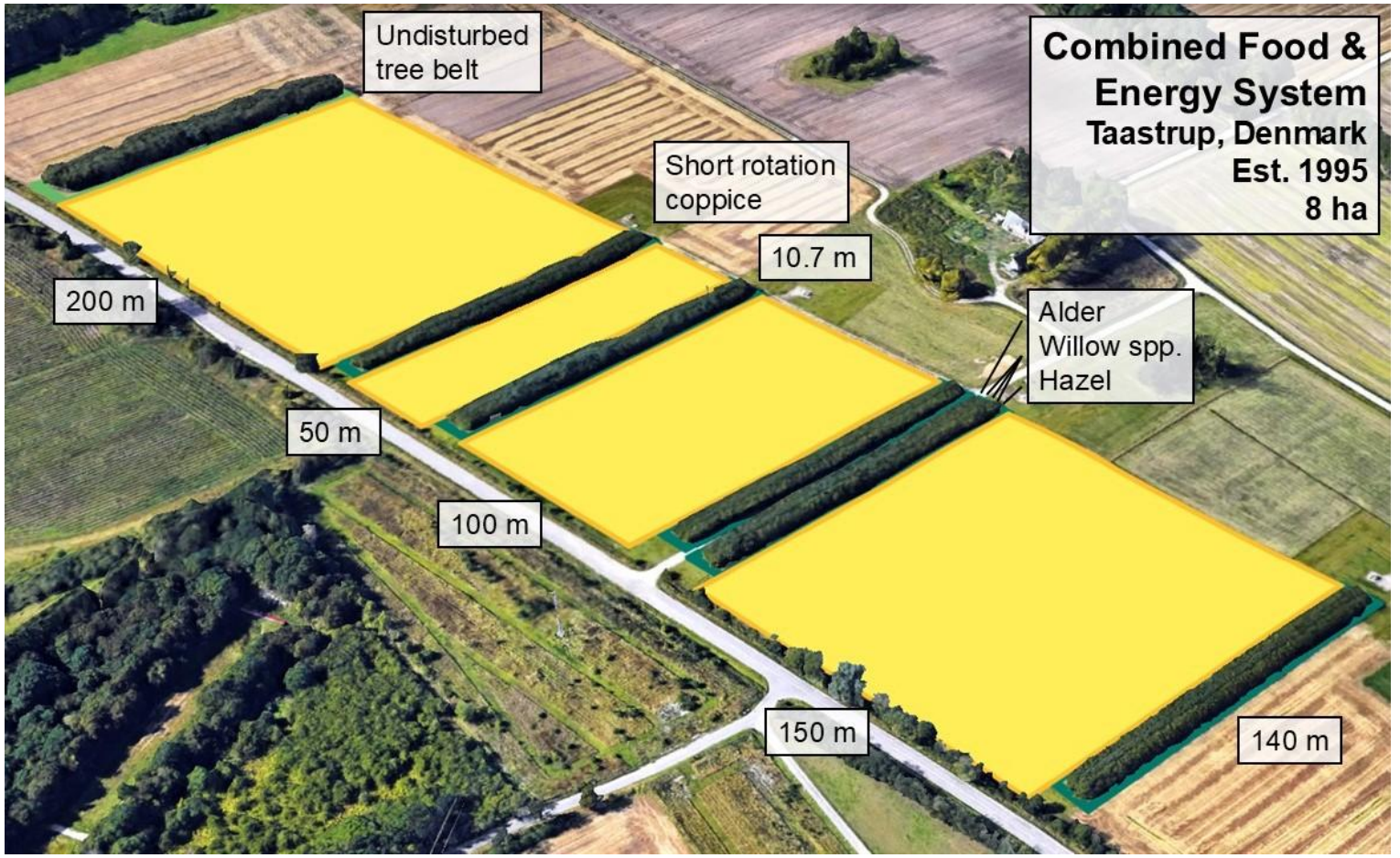
Vaibhav P Chaudhary (Postdoc researcher)

Vaibhav has a background of Plant Breeding and Genetics. He has worked on aspects of drought in pearl millet crop and NUE and identification of new favourable alleles in maize crop. His experience in private and public research industry comes with background in quality assurance and control in seed production (veg and field crops). Current avtivities with University of Copenhagen are towards quantification of agronomic yields and ecosystem

Saad Mir PhD Student at Department of Plant and Environmental Sciences, University of Copenhagen

Saad Mir has a background in Plant nutrition/Agronomy. Saad has experience working on hydroponic production, biochars, coated fertilizers and agro-nanotechnology to improve crop nutrient-utilization. Currently research activities include biostimulant effect in correlation with intercropping and microgreens productions through hydroponic system. My research areas cover field crop production, organic farming, nutrient uptake and utilization, Agro-nanotechnology and hydroponic system/vertical farming system.

Albert Colom, Research Assistant, is specialized in environmental and natural resource economics, with the use of quantitative methods and data analysis His main interest lies in agricultural economics, focusing on agroecology and agroforestry. He has experience in conducting environmental cost-benefit and cost-effectiveness analyses of multiple land-use types, with the estimation of ecosystem services through ecological modelling techniques. Current research includes ecological assessments of a silvoarable and intercropping systems.



Agroforestry for:

- Soil health
- Biodiversity
- Climate resilience
- Water and nutrient management
- Carbon sequestration
- Aesthetics and other cultural values

Combined Food and Energy System (CFE):

- Established ca. 30 years ago
- Organic with no external inputs
- Cereal rotation with spring oat, winter wheat, spring barley and 2 years grass-clover ley
    - Crop residues and grass cuttings left on the field
- Trees coppiced every 4 years for bioenergy and mulching

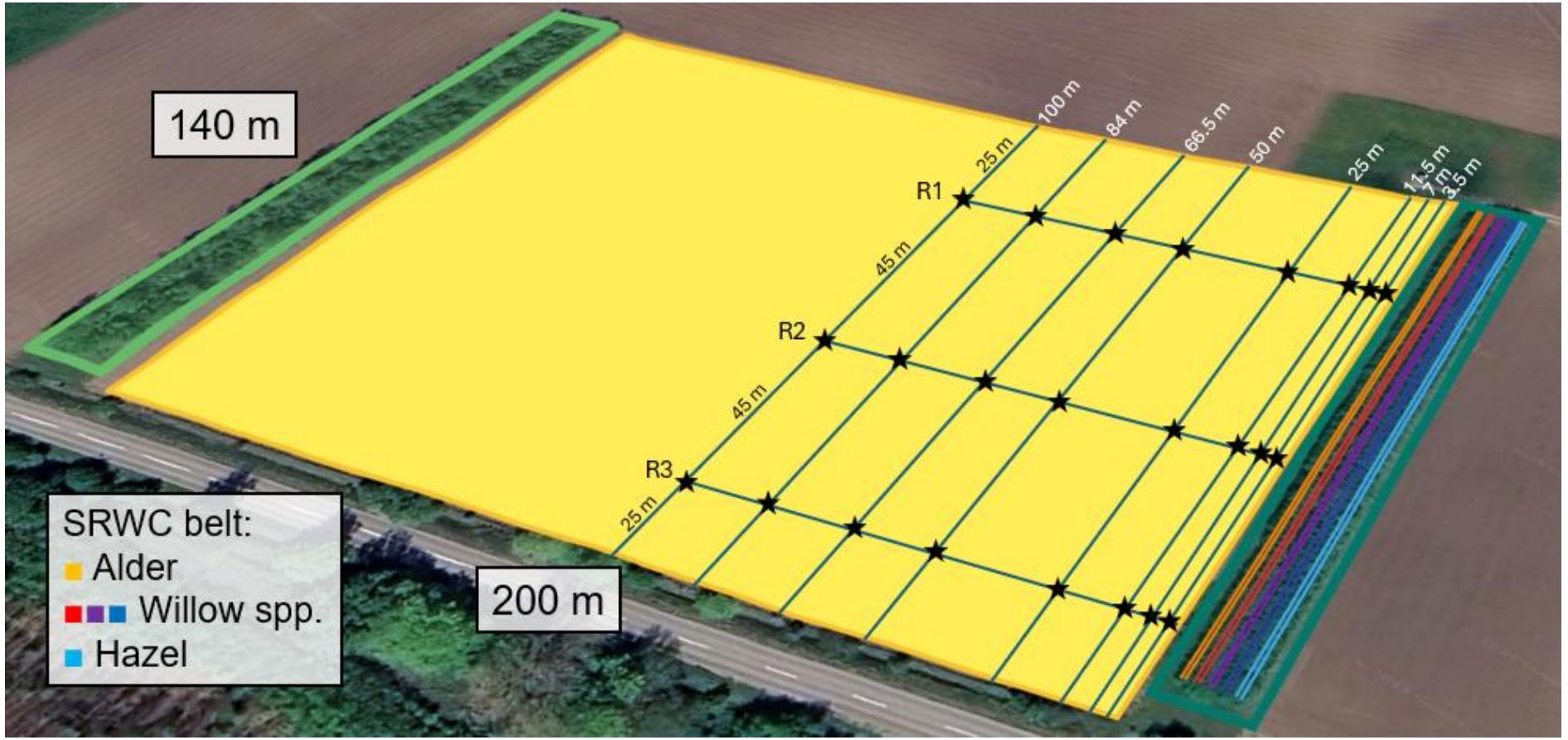
UNIVERSITY OF COPENHAGEN
FACULTY OF SCIENCE
Department of Plant and Environmental Sciences
Højbakkegård Alle 30, Taastrup, Denmark

Showcase of Technologies and Solutions
Living-Labs for Mitigating Climate Change in Agriculture
24th - 25th April 2025, Espai Bital, Barcelona

REFOREST

Harnessing soil organic carbon: Unlocking benefits for crop productivity and climate resilience with agroforestry systems

Albert M. Colom Bauza* (amcb@plen.ku.dk), Vaibhav Pradip Chaudhary (vpc@plen.ku.dk), Bhim Bahadur Ghaley (bbg@plen.ku.dk)



RESULTS AND DISCUSSION

The soil organic carbon (SOC) grain yields significantly increased further into the alley ($p < 0.05$).

Tree competition for resources can affect crop yields, which is well documented in temperate agroforestry systems (Van Vooren Laura et al. 2017).

Our study finds that these interactions drive SOC dynamics in long-term SRWC-cropping systems:

- Reduced crop residue inputs near the tree belt results in lower SOC content.
- Due to their limited size (Pardon et al. 2017), SRWC cannot compensate with OM inputs from leaf fall and root decay (Cardinael et al. 2017).
- As resource competition diminishes with distance from the tree belt, increasing SOC further promotes larger amounts of crop organic inputs due to SOC positive effects on plant growth (Oldfield et al. 2019).

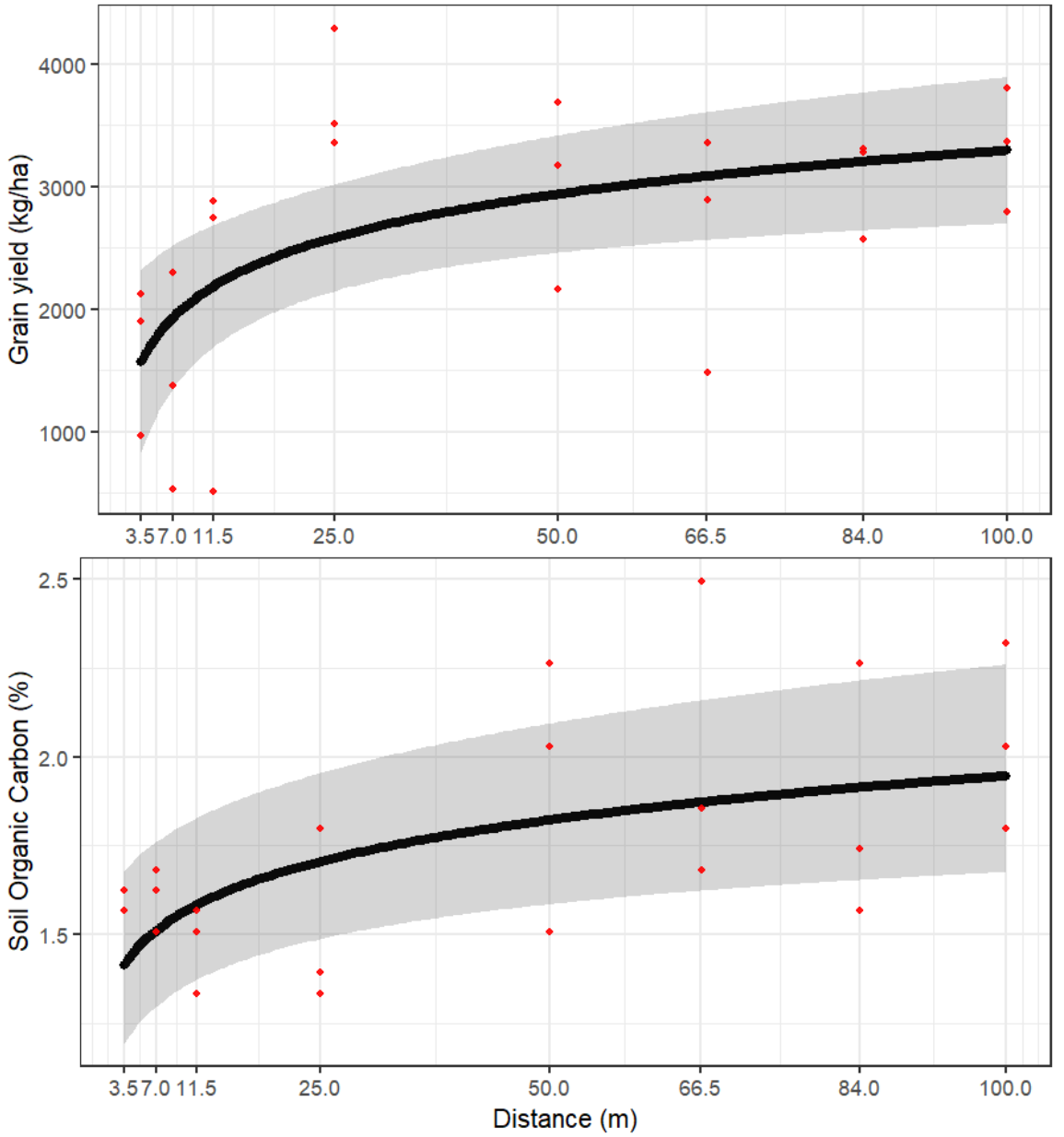


Figure 3. Yield and SOC dynamics in the crop alley at different distances from the SRWC belt, with estimated confidence intervals (grey) and field observations (red).

Showcase of Technologies and Solutions
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REFOREST

UNIVERSITY OF COPENHAGEN

Comparative carbon stock quantification in diverse production systems: Paving the way for sustainable agriculture

Bhim Bahadur Ghaley* (bbg@plen.ku.dk); Albert Miquel Colom Bauza (amcb@plen.ku.dk) & Vaibhav Pradip Chaudhary (vpc@plen.ku.dk)
Department of Plant and Environmental Sciences, UCPH, Højbakkegård Alle 30, Taastrup, Denmark. *Corresponding author.

Objective

To quantify and compare the total carbon stock between organic agroforestry system(AF), conventional winter wheat (CWW) and tree monoculture (TMC) in Denmark.

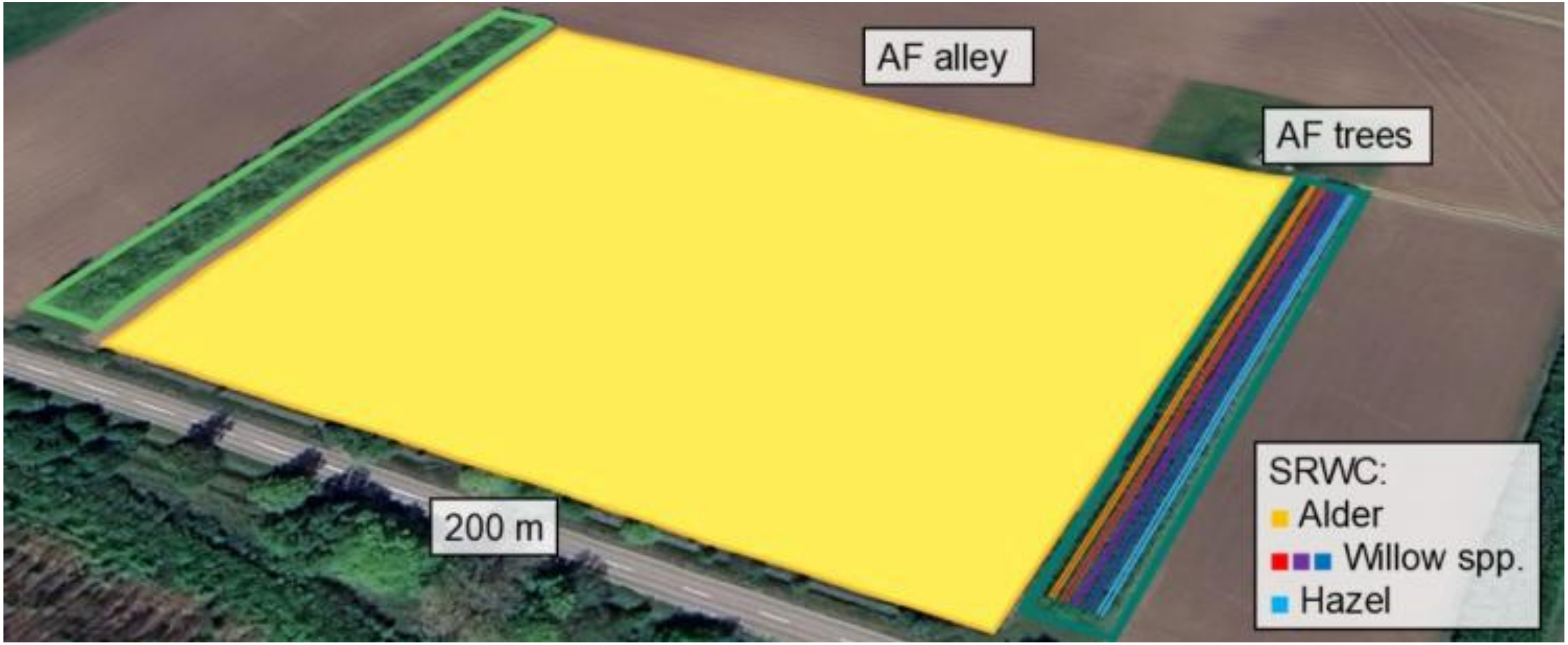

Fig. 1. Aerial view of AF system in Denmark.

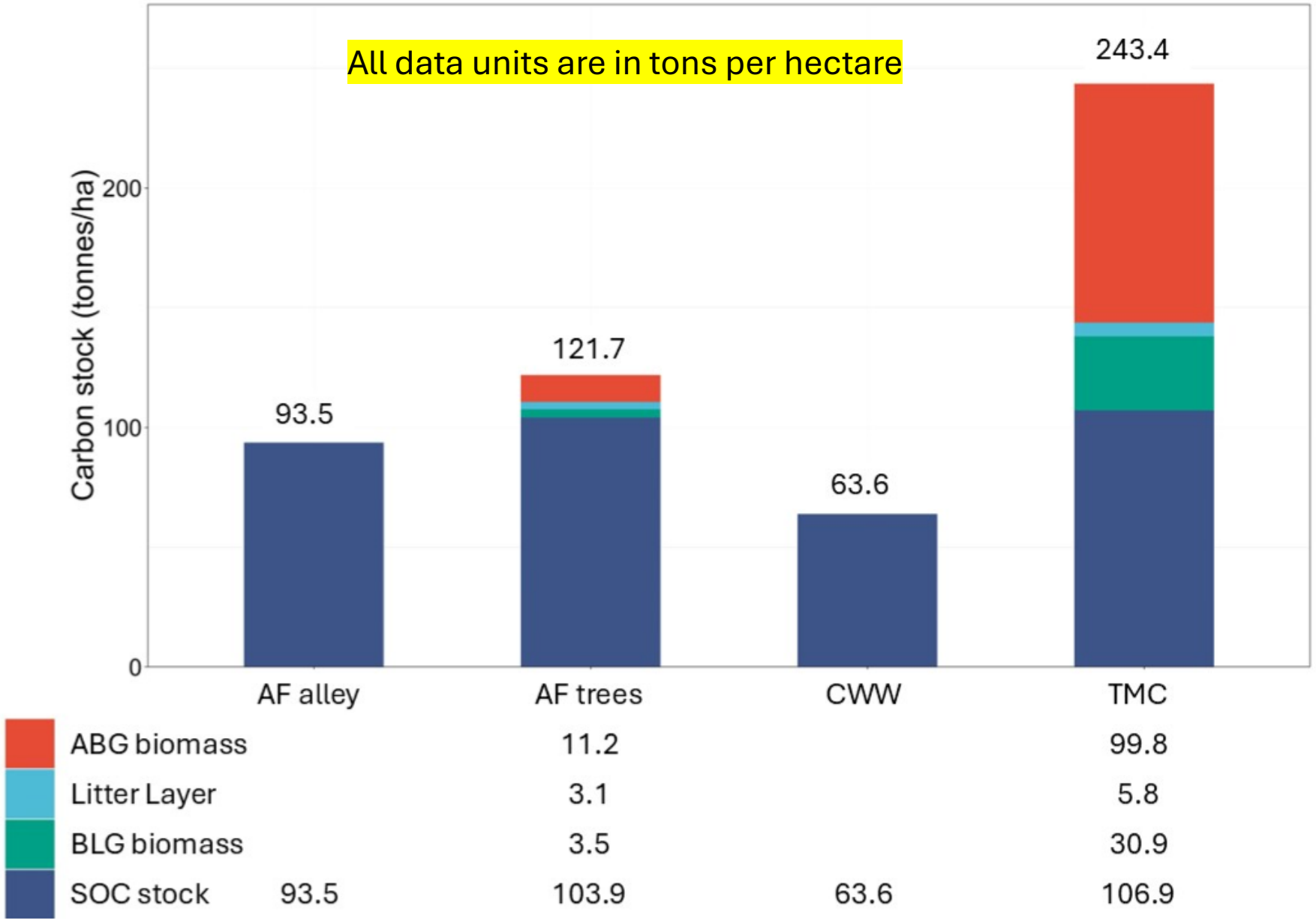

Fig. 2. Total carbon stock in agroforestry system compared to conventional winter wheat (CWW) and tree monoculture (TMC) in Denmark

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https://agroreforest.eu