@agronomix_

Phenology and growth of 5-year age poplars arranged in wide-spaced alleys and their interaction with the intercropped maize in a silvoarable model of NE Italy

Simone Piotto
PhD – University of Padova, Dip. DAFNAE

7th European Agroforestry Conference
EURAF 2024

VENETO AGRICOLTURA

1222·2022 800 ANNI · UNIVERSITÀ DEGLI STUDI DI PADOVA

DAFNAE
Dipartimento di Agronomia Animali
Alimenti Risorse naturali e Ambiente

TESAF Dipartimento Territorio e Sistemi Agro-Forestali
Università di Padova

crea
Consiglio per la ricerca in agricoltura
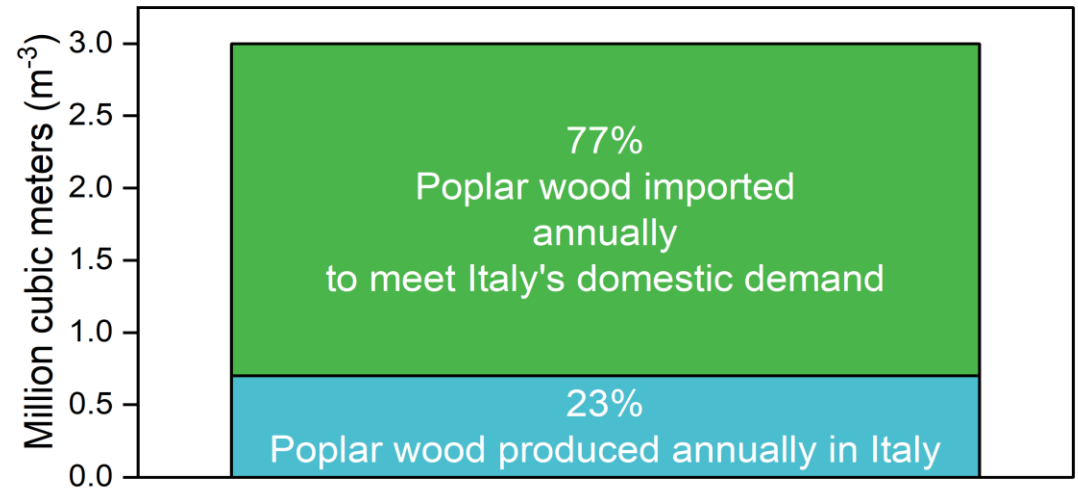e l'analisi dell'economia agraria

Introduction

- There is the necessity of more sustainable and resilient farming systems

- European Farmers are becoming interested in silvoarable systems

- In Italy with the rising demand of poplar wood, Italian farmers are considering to cultivate poplars together with crops

Italian poplar wood consumption

77%
Poplar wood imported annually
to meet Italy's domestic demand

23%
Poplar wood produced annually in Italy

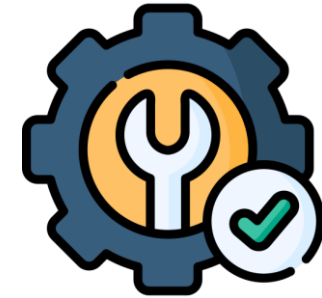Million cubic meters (m^{-3})

Introduction

Why poplar is **interesting** for alley-cropping systems?

It grows rapidly, generating a **fast economical return**

Its **light shading canopy** ensures minor crop yield **impairments**

Poplar management know-how is well widespread in Italy

Introduction

Another further reason:

Highly environmentally sustainability (HES) clones
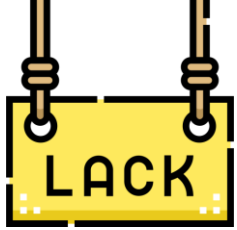Poplar clones <u>more resistant</u> to crown diseases

Clones developed by CREA - Forestry and Wood in Casale Monferrato (Alessandria, Italy)

NEW

Poplar Diseases	Resistance to disease		
	Scarce	Sufficient	High
Spring defoliation			■
Rusts		■	■
Marsonnina brunnea	■		■
Branch cankers		■	■
Brown spots		■	■
Poplar mosaic virus			■ ■
P. passerinii	■		■

■ I-214 (conventional clone)

■ Moncalvo (HES clone)

Introduction

There is **little information** available:
- **Growth of trees** cultivated at low densities
- **Impact of tree shading on crop yield**

Objectives

1. **Comparing DBH** and **tree height** of various HES **poplar clones**, in an alley-cropping system (AF) vs. poplar plantation (C)

2. **Monitoring** the **radial growth** and **leaf phenology** of **three promising HES poplar clones** in an alley-cropping system (AF) vs. poplar plantation (C)

3. **Assessing yield** response of **inter-crops** as influenced by poplar vicinity
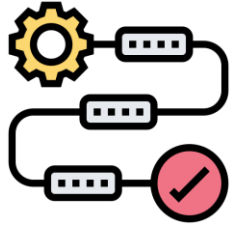
Methodology

The trial was conducted in **2023** at the **«Sasse-Rami» experimental farm of Veneto Agricoltura**, where are present adjacently a 5-year old **silvoarable system with poplar** (AF) (35 trees ha^{-1}) and a **poplar plantation** (C) (277 trees ha^{-1}), both **with the same poplar clones**.
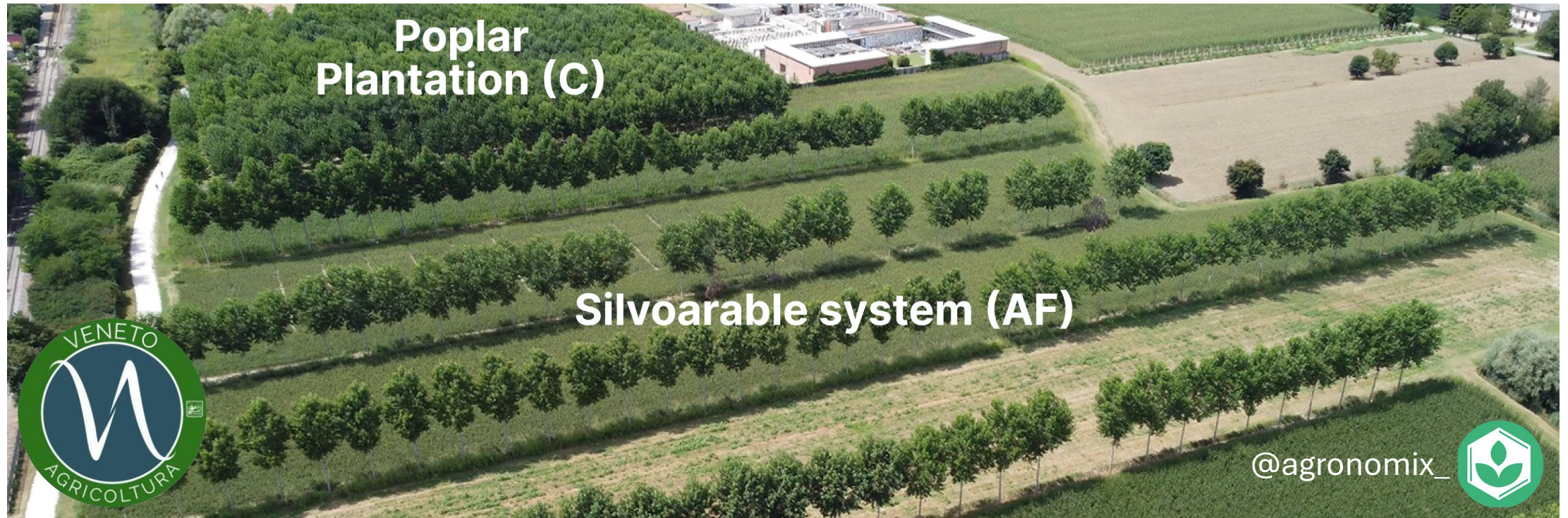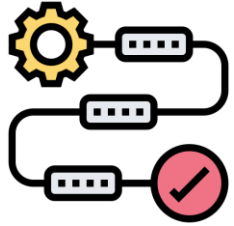
Methodology

- **Poplar DBH, height, and stem volume** of every clone was evaluated at the **end of 2023**, while **phenology and radial growth** of three HES poplar clones (Moncalvo, Tucano, and Aleramo) **during 2023.**

- **Maize grain yield** was assessed at harvest through 1-m^2 sampling areas along transects orthogonal to poplar rows **at different distances** (+3 m, +6 m, and +12 m) **and both sides** (east and west). The centre of the alley was considered as the control point (FS, 20 m).
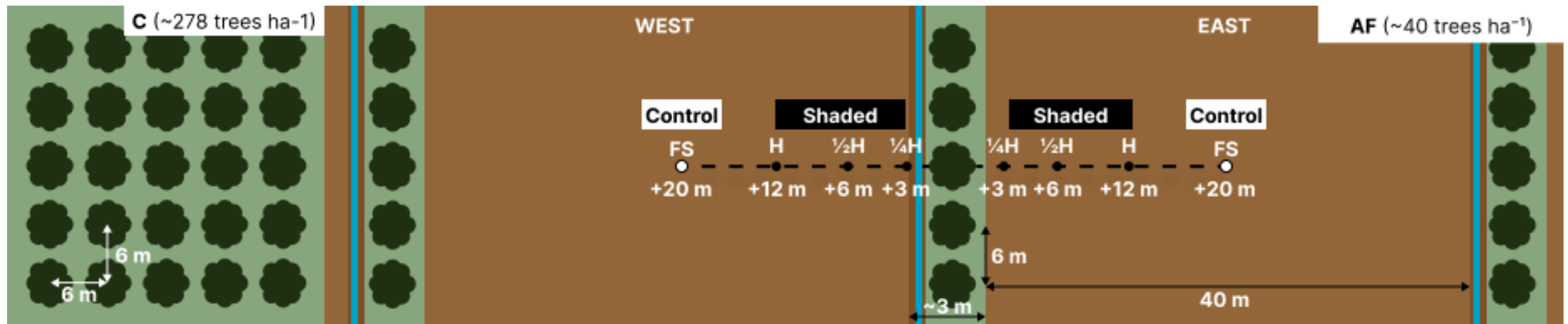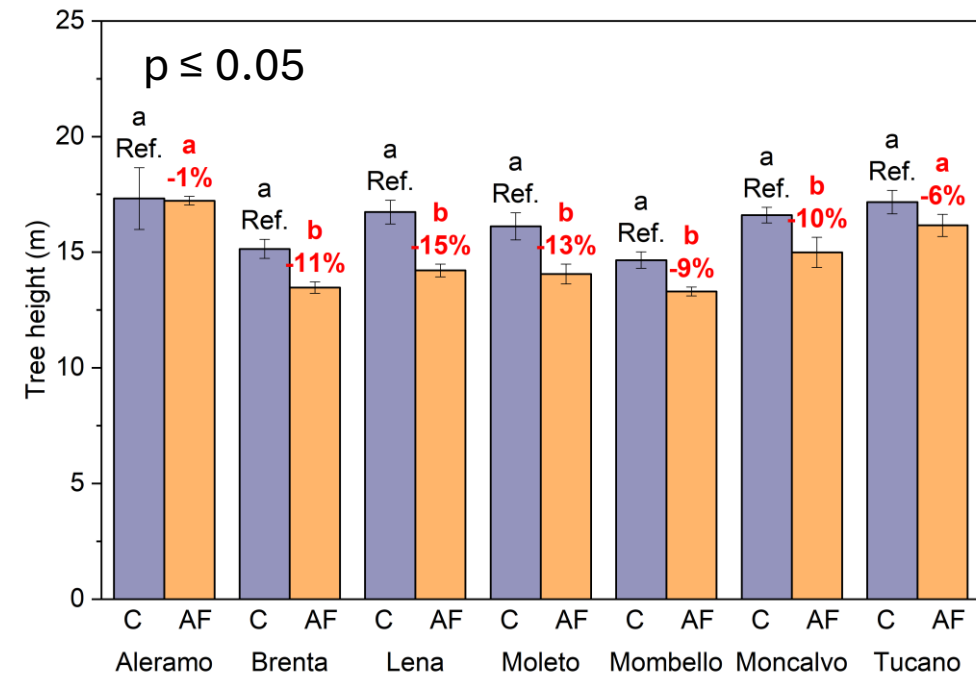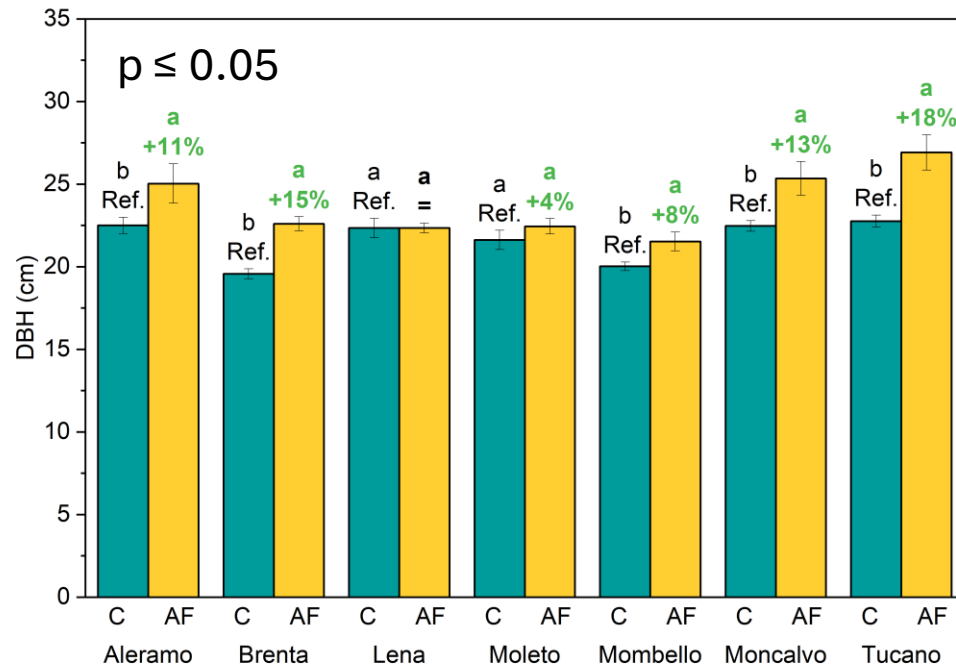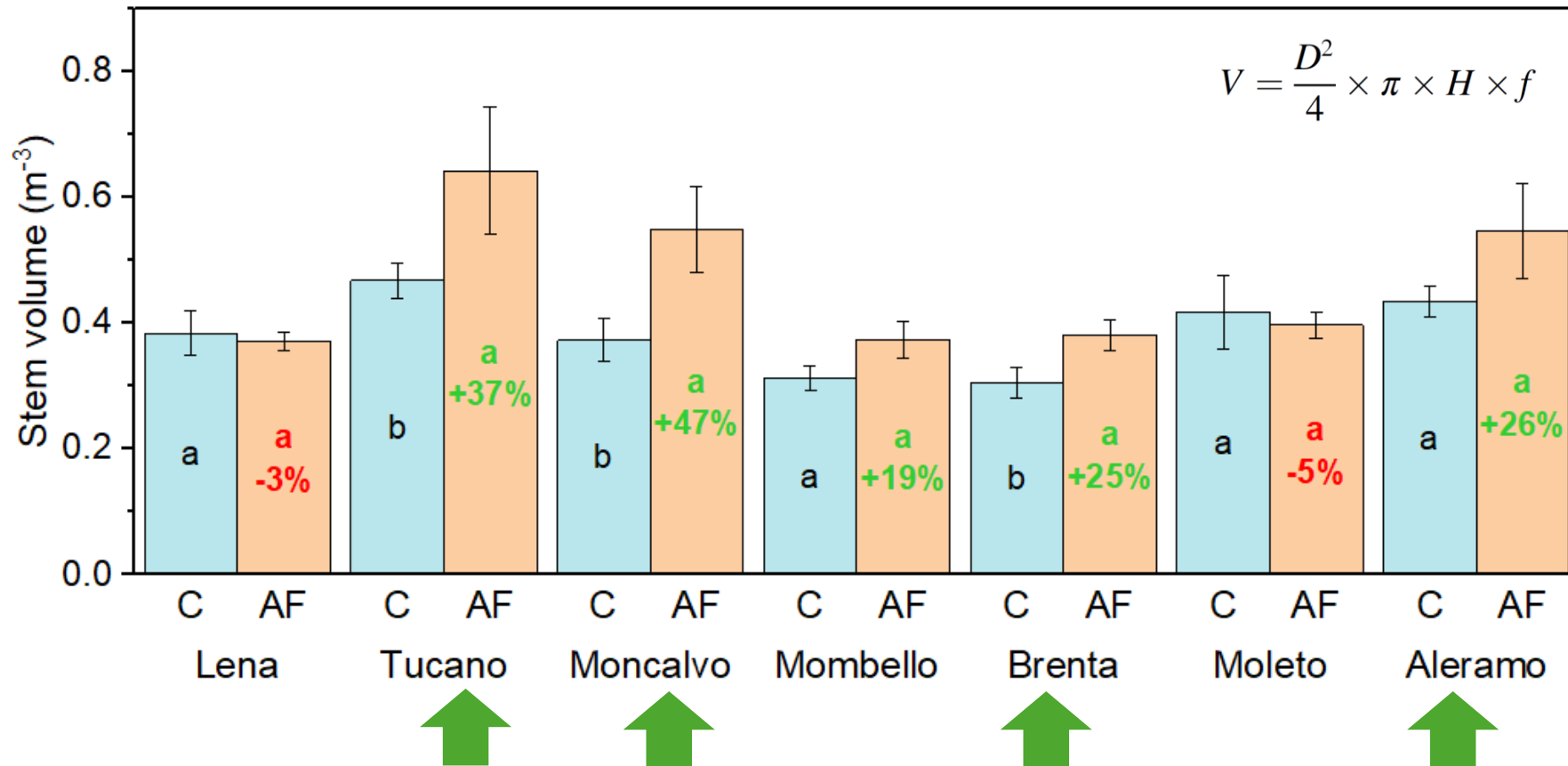
Results

AF vs. C

DBH
+10% on avg.

Poplar height
-9% on avg.

Results

Stem volume is a **more appropriate index** to evaluate the **productivity** gap between AF vs. C **+21%**

Results

Vegetative phenology was delayed **up to one week in AF** vs. C and **up to one month among poplar clones** (Aleramo vs. Tucano)
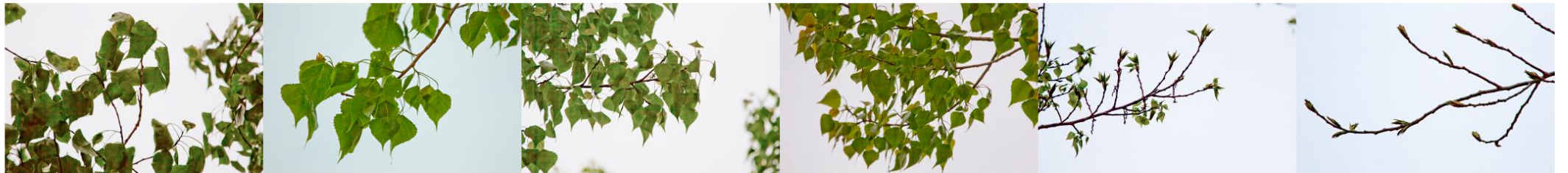

Aleramo (Early)   **Moncalvo (Medium)**   **Tucano (Late)**
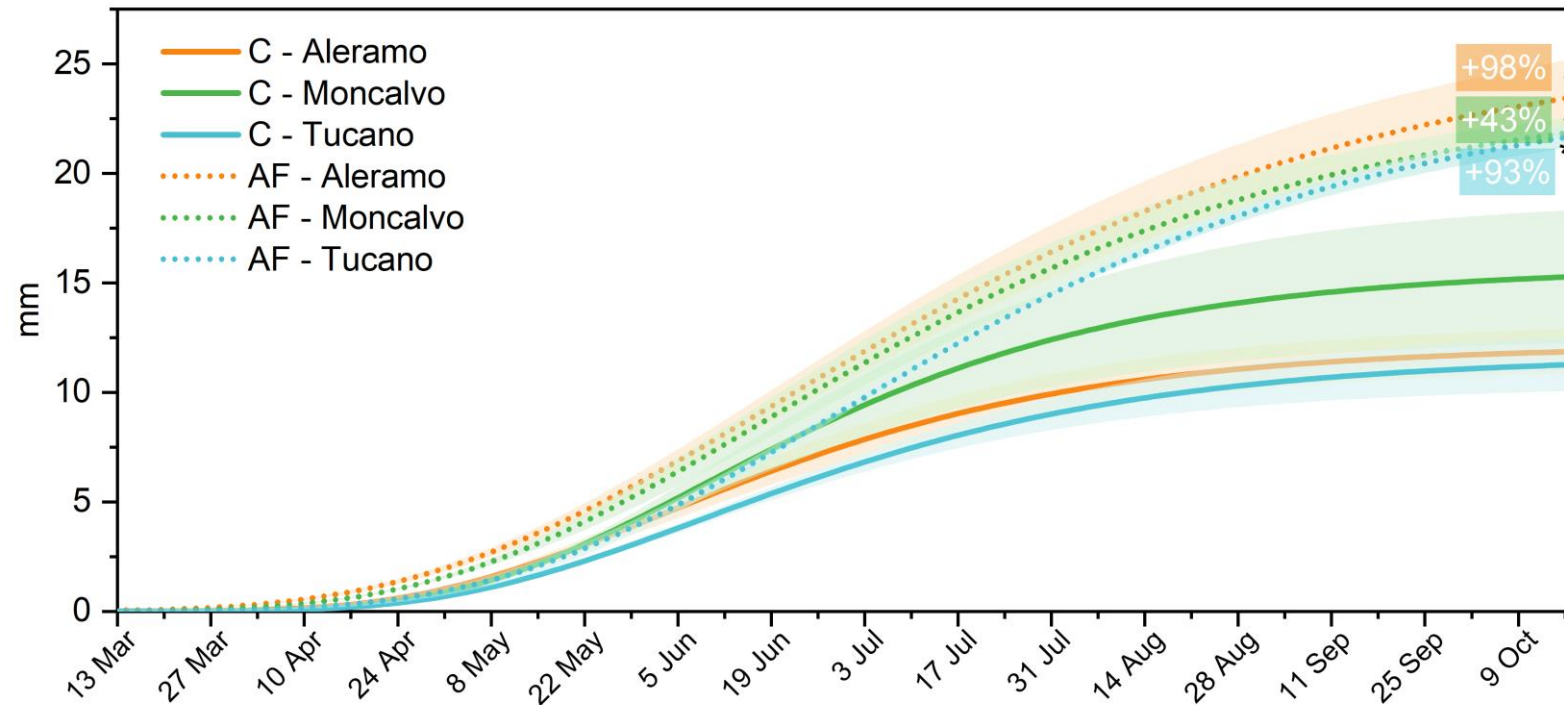
C   AF   C   AF   C   AF

12th of April

Results

Radial growth in 2023 growing season were **double** in **Aleramo** and **Tucano** in AF and 43% higher in Moncalvo in AF compared to C.

Legend:
- C - Aleramo
- C - Moncalvo
- C - Tucano
- AF - Aleramo
- AF - Moncalvo
- AF - Tucano

+98% *
+43% *
+93% *

Dendrometer to measure radial growth.

Results

1. **Treatment** - Maize **grain yield** was lower by **25% on avg.** (n.s.) in poplar rows proximity

2. **Distance** - The **lowest yields** were at **+6m** (-32% on avg) and at **+3 m** (-51% on avg)

3. **Side** - The **lowest impairments** were at **west** of poplar rows (-34% vs. C; p ≤ 0.05)
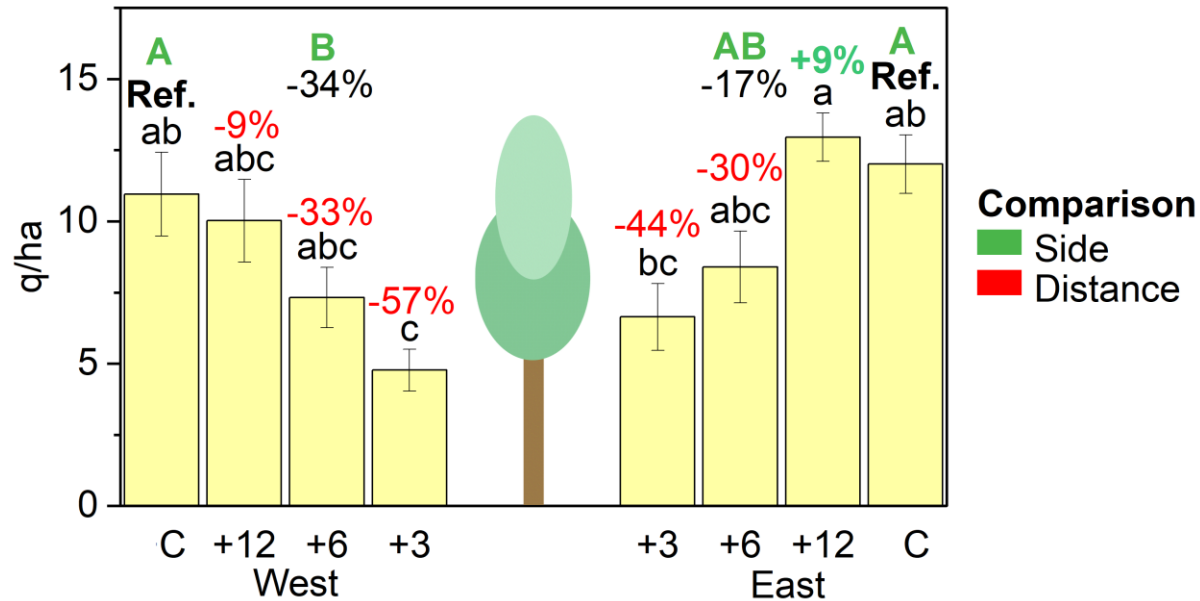
Final remarks

1. In terms of timber productivity and tree stability (DBH:H ratio) there is an advantage in intercropping poplar with crops

2. New HES clones are highly suitable for Alley-cropping

3. Promising results from **Tucano** **(30 cm DBH in AF after six years)** and **Moncalvo** **(stem volume +47% in AF)**

4. The phenology gap between **late and early budding clones** was up until one month

5. In a low-density design with trees at the end of their cycle (8-10 years) a **slight maize yield reduction** was shown
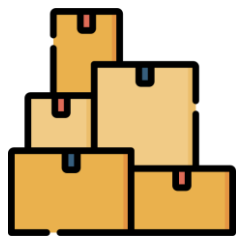
Other projects

Water use
efficency of
poplar clones

Sap flow

WORK IN
PROGRESS

In pot trials

Soil
biodiversity

**Environmental
sensors**

Impact of poplars on
microclimate

Future research

Economical
assessment

Harvesting
process

COMING

SOON

Pruning
techniques

Wood
quality
evaluation
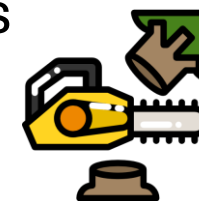
Post-harvesting
resettlement

Thanks for the attention!

Acknowledgements