Productivity of silvoarable systems established with *Prunus avium* L. in Galicia (NW Spain)

Authors: Nuria Ferreiro Domínguez
Antonio Rigueiro Rodríguez
Mª Rosa Mosquera Losada
✓ Introduction
✓ Objective
✓ Materials and methods
✓ Results and discussion
✓ Conclusion
INTRODUCTION
In the last years, the forest area is increasing gradually and therefore the availability of agricultural area is decreasing.

Silvoarable Systems trees are intercropped with annual or perennial crops on the same unit of land.
Silvoarable systems present many economic, environmental and social advantages compared with exclusively agronomic and forest systems.
Maize (Zea mays L.)

- In Galicia, maize is the main crop to overcome shortage periods during the summer and winter.
- Galicia imports maize from Brasil (55.9 millions of € per year).
- Due to the high productivity, maize produces silage of high quality from an energy point of view, but with low protein content.
- Maize usage for feeding dairy cows is less costly than grass silage, but also with less flexibility (maize lands cannot be used for grazing in low productive springs).
Prunus avium L.

Low shade compared with more extended use tree species in Galicia region.

Rapid growth which promotes its valuable timber and the delivery of better returns than other broadleaf species.
OBJECTIVE
OBJECTIVE

To evaluate the production of maize and the tree growth in a silvoarable system under *Prunus avium* L. established at three densities (333, 666 and 1333 trees ha\(^{-1}\)) in Galicia compared with exclusively agronomic and forest systems.
MATERIALS AND METHODS
Design of randomized blocks (7 treatments and 3 replicas)

Plantation of *Prunus avium* L. in 2008 (initially mixed stand which was managed to establish *Prunus avium* L. at the final densities of 333, 666 and 1333 trees ha⁻¹)

Forage maize was sown in May 2014
EXPERIMENTAL DESIGN

Distance between plants rows: 0.75 m
Distance between plants within a row: 1.15 m
TREATMENTS

SILVOARABLE SYSTEM

1. Maize + Trees (333 trees ha$^{-1}$) (LD)
2. Maize + Trees (666 trees ha$^{-1}$) (MD)
3. Maize + Trees (1333 trees ha$^{-1}$) (HD)

AGRONOMIC SYSTEM

4. Maize (NF)

FOREST SYSTEM

5. Trees (333 trees ha$^{-1}$) (LD)
6. Trees (666 trees ha$^{-1}$) (MD)
7. Trees (1333 trees ha$^{-1}$) (HD)
FIELD SAMPLINGS

Production of Maize

In each plot ten plants of maize were collected and weighed while fresh and maize final density was accounted in rows (October 2015).

Trees

The tree height and the tree diameter at breast height were measured with a vertex and a calliper, respectively (June 2015).
Production of Maize

The plants were fractionated into the components:

- Aborted cobs
- Cobs without grains
- Stems
- Leaves
- Grains

These components were dried and weighed to estimate the dry matter production (60°C x 48 hours)
STATISTICAL ANALYSIS

✓ ANOVA

\[ Y_{ik} = \mu + T_i + B_k + TB_{ik} + \varepsilon_{ik} \]  
(Y_{ik}: dependent variables, \( \mu \): variable mean, \( T_i \): treatment, \( B_k \): block, \( TB_{ik} \): treatment-block interaction and \( \varepsilon_{ik} \): error)

✓ LSD

✓ Regression analyses were also performed
RESULTS AND DISCUSSION
RESULTS AND DISCUSSION

NT: maize production similar to the production found in different areas of Galicia for the same variety (CMR 2015)

NT higher maize production than LD, MD and HD:
Shade generate by the trees
Lower available area of maize in the plots with trees
Maize variety was selected for open sites
Maize production decreased when the tree density increased.

Maize production = $2E^{-0.05}$ Tree density$^2$ - 0.0447 Tree density + 26.023

$R^2 = 0.9977$
RESULTS AND DISCUSSION

Negative effect of the maize sowing on the height (MD) and the diameter of the trees (HD): TILLING PROCESS
Maize production was decreased as the tree density increased probably due to the shade generated by the trees and the surface occupied by trees and because maize variety was selected for open sites.

Tree growth decreased in the plots with maize which could be explained by the tilling process carried out before the maize sowing that destroyed tree roots that should be further tested to evaluate if tree recovery is produced.

Therefore, it is necessary continue our study to properly evaluate the tree growth and the production of maize in this type of agroforestry systems.