GROWTH AND YIELD RESULTS OF TIMBER TREES MIXED WITH POPLAR SRC: 9 YEARS OF AN EXPERIMENTAL PLOT IN THE PO VALLEY

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This new cultural model has been firstly tested in Northern Italy (2007), and then within a EU Project (AgroCop 2012-14).

Alley coppice:
Integration between timber trees and Short Rotation Coppice tree crop

Morhart et al, 2015, Annals For Sci

Advantages
1. Multipurpose cultivations
2. Periodical incomes from biomass
3. Tutoring and protection on timber trees
4. Soil protection, GHG absorption, biodiversity

Problems
1. Higher planting costs
2. Complex management
Materials and methods

The site
Casale Monferrato – AL
Lat: 45°08’42” N
Long: 8°30’31” E
Alt: 106 m a.s.l.

Timber trees
*Pyrus* and *Sorbus* clones
in vitroculture propagated
(Univ. Milan) and grown 1 year in box

SRC – 3 Poplar clones:
*Populus deltoides* ‘Lux’
‘Oglio’
*P. × canadensis* Triplo
Experimental design

**Timber trees:**
*Complete randomize blocks with 4 rep.*
Experimental unit 720 m²

**SRC:**
*Split in sub-plot*
Experimental unit clone 150 m²
Establishment and tending

- Soil ploughing (30 cm depth) and harrowing before planting.
- Poplars horizontal unrooted long cuttings (120 cm)
- Hardwood seedlings, one year old
- *Lolium perenne* as cover-crop
- Herbicides spraying after planting only on poplar
- Soil harrowings for weed control, once in late spring.
- Sprinkler irrigation once - twice per year.
- 1-2 treatments against *Crisomela populi* in the spring and summer (SRC)
- The SRC plots were harvested at the end of the 2\(^{nd}\), 4\(^{th}\), 6\(^{th}\) and 8\(^{th}\) year
Results: tree growth

Growth of timber trees and poplar SRC

Timber trees in pure stands are bigger than those grown in association with SRC poplars (p<0.05).

During 2015, due to water availability and low competition in height timber trees (particularly Pyrus) improved their growth.
Results: water and light competition

Soil moisture content 0-100 cm

No water competition between timber and SRC trees (2014, 8th gs; R8/S2)

Hemispherical photos for studying Total Light Transmittance (TLT)

Timber trees in AC: -24% Solar Radiation than Pure treatment
Results

Explorative assessment of wood quality of timber trees

\[ Q = 3L - (E + F + DI + DF + DM + CF + Kn + EB) \]

- **L** = log morphology coefficient
  (log length and stem straightness)
- **E** = stem eccentricity
- **F** = fibre orientation
- **DI** = insect damage
- **DF** = bacteria/fungi damage
- **DM** = mechanical damage
- **CF** = presence/absence of a critical fork
- **Kn** = knots
- **EB** = epicormic branches

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Q</th>
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<tbody>
<tr>
<td>Alley coppice</td>
<td>55</td>
</tr>
<tr>
<td>Timber only</td>
<td>32</td>
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</tbody>
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Concluding remarks

• The high competition caused statistically significant effects on the timber trees: negative ones on growth, particularly in the first years, and positive ones on their stem shape (i.e. SRC protect Timber trees from wind and storm) reducing pruning intensity too.

• After nine growing seasons, the timber trees in the alley coppice stands reached satisfactory dimensions, besides improved stem shape and wood quality, in comparison with the timber trees grown in pure stands.

• The competition can be mitigated by increasing the distance between timber trees and poplarSRC.
AgroCop Project: Yield and Financial simulation

Yield simulations (by Jeremy Andrè, INRA Montpellier)

Net present value simulations (by Luca Tosi, PhD CNR IBAF)
Using alley coppicing for establishing timber trees in agroforestry systems

Planting some timber tree lines when establishing a SRC plantation can be a feasible way of integrating timber and bioenergy production.

Once the SRC stools will be removed (approx. after 10-15 years), the timber trees should have a good size and stem form.

Those tree can be intercropped with herbaceous crops into an agroforestry management.