Multi-stakeholder dialogue and simulated scenario planning to change forest management practices in Alentejo

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Susana Barreiro
Pedro Serra Ramos, Alexandra Oliveira, João Rua, Joana Paulo, Paula Soares, Sónia Faias, João Palma, Ágata Lam,…

FINAL CONFERENCE
12 – 13 OCTOBER 2017
PARIS, France
Pilot Project objective

Increase **WOOD MOBILIZATION** in Alentejo

**Traditional wood production species**

- *Eucalyptus globulus* (9%)
- *Pinus pinaster* (4%)

**Non-traditional wood production species**

- *Quercus suber* (45%)
- *Pinus pinea* (6.5%)

**Eucalyptus globulus and Pinus pinaster**

Propose measures to increase wood availability through **forest management** using a ‘sustainable intensification’ concept

**Quercus suber and Pinus pinea**

Assume the use and mobilization of wood from thinning non-traditional wood production species
Pilot Project methodology

Simulate **STAKEHOLDER-DEFINED MANAGEMENT SCENARIOS**

**RLL2 – Oct 2015**
- SIMWOOD Presentation
- StandsSIM simulator description
- Explanation of the FMAs concept and request of stakeholders’ help

**RLL3 – Oct 2016**
- StandsSIM description
- Explanation of the FMAs concept and request of stakeholders’ help

**RLL4 – Mai 2017**
- Presentation and discussion of the 1st simulation results
- Definition of the FMAs and scenarios

**RLL1 – Oct 2014**
Identify main barriers, strengths and solutions

**Training Courses**
**Jun & Jul 2017**
- Presentation and discussion of the 1st simulation results
- Definition of the FMAs and scenarios

[www.simwood-project.eu](http://www.simwood-project.eu)
Pilot Project methodology

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FC2
Assess the economic impact of NWFPs and services (hunting and ecotourism)

FS1
Quantify wood available by species its level of utilisation

RLL1 – Oct 2014
Identify main barriers, strengths and solutions

Training Courses
Jun & Jul 2017
- Presentation and discussion of the 1st simulation results
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Pilot Project methodology

STAKEHOLDERS TASKFORCE

Forest Companies

Land Owners Associations

Public administration

Research

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To evaluate the impact of the PP on forest managers’ attitudes

- Prepared the prescriptions, scenarios and run the simulations
- Improved the simulator and the user-friendly interface
- Made StandsSIM available on FCTools website (description of the tool available)

... To evaluate the impact of the PP on forest managers’ attitudes


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Simulations outline

Alentejo Pilot Project

StandsSIM.md and SUBER simulators

Stakeholders and management scenarios

Simulation results

Final remarks and future steps

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01 Alentejo study area

Alentejo region:

- Reduced population density \( (19 \text{ habitantes/km}^2) \)
- Aged population \( (25\% \text{ older 65 years}) \)
- Most forest owners are farmers and some do not have technical knowledge
- 97\% land is private property

- Changes due to severe forest fires 2003 and 2005
- 44.74 \% forest cover

  - mainly managed as agro-forestry systems
  - forest cover: 9\% \( E. \text{ globulus} \), 4\% \( P. \text{ pinaster} \)

INE, 2011a,b
01 Comparison between NFI4 and NFI5

Increase in forest area (Q. suber, E. globulus, P. pinea)

[Diagram showing forest area by dominant tree species for NFI4 and NFI5]

NFI5 (2005-2006)
01 Comparison between NFI4 and NFI5

Increase in the proportion of **uneven-aged** and old stands **(older than 16)**

**E. globulus** % area by age class (years) vs **P. pinaster** % area by age class (years)
Slight increase in the proportion of under-stocked stands (trees dbh < 5 cm disregarded)

Comparison between NFI4 and NFI5

E. globulus % area by stand density class (10^3 ha)

P. pinaster NFI plots by Wilson factor class

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02 How StandsSIM.md and SUBER work

Planning horizon:
Number of years the user wants to simulate

Forest stands input:
Data from forest inventory and site characterization

Other inputs and simulation parameters

Planning horizon

Land Use Changes (afforestation)

Climate

Management (FMA)
Even- and uneven-aged

Prescriptions
One prescription per stand

Growth Models

GLOBULUS
GYMMA
PINASTER
PBIROL
PINEA.pt
3PG-OUT+

SUBER

Outputs:
Annual/stand
Annual/region
Region and simulation

Inventory plots

Forest Resources t

Forest Resources t+1

StandsSIM.md and SUBER simulators

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03 StandsSIM.md and SUBER management inputs

- Forest management approach (FMA):

  Set of silvicultural operations from stand regeneration until final harvest
03 StandsSIM.md and SUBER management inputs

- **Forest management approach (FMA):**
  - Set of silvicultural operations from stand regeneration until final harvest
- **Prescription**
  - Sequence of FMAs throughout the planning horizon
Stakeholders and management scenarios

• Forest management approach (FMA):

Prescription A

Prescription B

Prescription C

Prescription D

Planning Horizon
03 Scenarios’ definition

Scenario drivers were selected based on the NFI data analysis and discussed with stakeholders helped defining FMAs, prescriptions and the total amount of each driver for characterizing the 4 scenarios.

BAU
Business as usual scenario reflecting the current forest management

Mob’s
Scenarios reflecting increasing levels of management intensification
Scenarios’ definition

Scenario drivers were selected based on the NFI data analysis and discussed with stakeholders helped defining FMAs, prescriptions and the total amount of each driver for characterizing the 4 scenarios.

BAU
Business as usual scenario reflecting the current forest management

Mob’s
Scenarios reflecting increasing levels of management intensification
Scenarios’ definition

A set of different prescriptions (one per plot) was assigned to each scenario.

The Drivers

1. Increase area of new plantations
2. Relocate less productive stands
3. Convert to even-aged stands
4. Convert to well-stocked stands
5. Re-plant old coppices (>3rd rot)
6. Increase harvest age

The Simulation

Planning horizon: 60 years (from 2005 to 2065 by 20-yrs period)

<table>
<thead>
<tr>
<th>Forest simulators:</th>
<th>StandsSIM</th>
<th>SUBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth models:</td>
<td>GLOBULUS3</td>
<td>PINASTER</td>
</tr>
<tr>
<td>E. globulus</td>
<td>(330)</td>
<td>P. pinaster</td>
</tr>
<tr>
<td>P. pinea</td>
<td>(153)</td>
<td></td>
</tr>
</tbody>
</table>
### Scenarios’ definition (Example for E.globulus)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mobilization drivers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAU</td>
<td>Mob1</td>
<td>Mob2</td>
<td>Mob3</td>
<td></td>
</tr>
<tr>
<td>New plantations ((\text{ha yr}^{-1}))</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Relocated plantations ((\text{ha yr}^{-1}))</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>15%</td>
</tr>
</tbody>
</table>

## Stakeholders and management scenarios

- **Simulation years**: 2005-2065
- **Mobilization drivers**: BAU, Mob1, Mob2, Mob3
- **New plantations** \((\text{ha yr}^{-1})\): 0, 0, 0, 0
- **Relocated plantations** \((\text{ha yr}^{-1})\): 0%, 0%, 0%, 15% (stands with \(S < 14\))

### Mobilization Drivers

- **BAU**: Baseline scenario.
- **Mob1**: Mobilization scenario 1.
- **Mob2**: Mobilization scenario 2.
- **Mob3**: Mobilization scenario 3.

### New Plantations

<table>
<thead>
<tr>
<th>Year Range</th>
<th>2005-2065</th>
</tr>
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<tbody>
<tr>
<td>0</td>
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</tr>
<tr>
<td>0</td>
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<td>0</td>
<td>0</td>
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</table>

### Relocated Plantations

<table>
<thead>
<tr>
<th>Year Range</th>
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</tr>
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<tbody>
<tr>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>0%</td>
<td>15%</td>
</tr>
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### Mobilization Drivers

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<tr>
<td>0</td>
<td>0</td>
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<tr>
<td>0</td>
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</tr>
</tbody>
</table>

### Relocated Plantations

<table>
<thead>
<tr>
<th>Year Range</th>
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</tr>
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<tbody>
<tr>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>15%</td>
<td>(stands with (S &lt; 14))</td>
</tr>
</tbody>
</table>

### Replant Rotations >3

<table>
<thead>
<tr>
<th>Year Range</th>
<th>2005-2065</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>0</td>
</tr>
<tr>
<td>20%</td>
<td>0</td>
</tr>
<tr>
<td>10%</td>
<td>0</td>
</tr>
<tr>
<td>0%</td>
<td>0</td>
</tr>
</tbody>
</table>

### Convert Uneven- to Even- Aged Stands

- **No conversion to even-aged stands considered**

### Convert Unstocked to Wellstocked Stands

- **No conversion to wellstocked stands considered**
- **(Replanting after the maximum rotation with 1100 trees ha\(^{-1}\))**

### Increase Rotation Age

<table>
<thead>
<tr>
<th>Year Range</th>
<th>2005-2065</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10: 12 yrs</td>
<td>0-10: 14 yrs</td>
</tr>
<tr>
<td>10-14: 11 yrs</td>
<td>10-14: 13 yrs</td>
</tr>
<tr>
<td>14-18: 10 yrs</td>
<td>14-18: 12 yrs</td>
</tr>
<tr>
<td>18-22: 9 yrs</td>
<td>18-22: 11 yrs</td>
</tr>
<tr>
<td>22-26: 8 yrs</td>
<td>22-26: 10 yrs</td>
</tr>
</tbody>
</table>

### Conversion to Even-aged Stands

- **Conversion to even-aged stands is considered**
- **Priority is given to stands over 200 m\(^3\)**
- **The remaining stands are randomly selected for harvest throughout the planning horizon**

### Conversion to Wellstocked Stands

- **Conversion applied to even- and uneven-aged stands**
- **Replanting immediately after harvest regardless of coppice rotation. Harvest takes place when harvest age is met (even-aged) or randomly throughout the planning horizon (uneven-aged)**
- **Planting densities vary according to S class**:

#### E. globulus

<table>
<thead>
<tr>
<th>S Class</th>
<th>Planting Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-18</td>
<td>1100 trees ha(^{-1})</td>
</tr>
<tr>
<td>18-22</td>
<td>1250 trees ha(^{-1})</td>
</tr>
<tr>
<td>22-26</td>
<td>1400 trees ha(^{-1})</td>
</tr>
</tbody>
</table>

### Increase Rotation Age

- **Uneven-aged stands with volume \(\geq 200 \text{ m}^3\) are harvested while those with lower volumes are randomly selected for conversion to even-aged throughout the planning horizon; whereas for even-aged stands harvest ages vary according to S class**: 

#### E. globulus

<table>
<thead>
<tr>
<th>S Class</th>
<th>Harvest Age</th>
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<tbody>
<tr>
<td>0-10</td>
<td>14 yrs</td>
</tr>
<tr>
<td>10-14</td>
<td>13 yrs</td>
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<tr>
<td>0-10</td>
<td>16 yrs</td>
</tr>
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<td>10-14</td>
<td>15 yrs</td>
</tr>
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<td>14 yrs</td>
</tr>
<tr>
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<td>13 yrs</td>
</tr>
<tr>
<td>22-26</td>
<td>12 yrs</td>
</tr>
</tbody>
</table>
Simulation results

Harvested volume (5 yrs moving averages)

- Substantial contribution of eucalyptus for increasing wood availability when compared to the other species
- Increase in wood availability from BAU towards Mob3

Volume harvested:
- *E. globulus* = final harvest
- *P. pinaster* = final harvest + thinning
- *Q. suber, P. pinea* = thinning

- *Eucalyptus globulus*
- *Quercus suber*
- *Pinus pinaster*
- *Pinus pinea*
Simulation results

**04 Simulation results**

% of thinned volume used:

- 0%
- 25%
- 50%
- 75%

**Harvested volume by 20 yrs period**

*Eucalyptus globulus*

In the 1st 20-yr period no substantial differences among scenarios were detected, becoming evident over the next years.

*Non-traditional wood production species* - if considered, an increase over 18 million m³ could be expected in Mob3.
Simulation results

Harvested volume by 20 yrs period

% of thinned volume used:
0%  25%  50%  75%

E. globulus
In the 1st 20-yr no substantial differences among scenarios were detected, becoming evident over the next years

P. pinaster
The BAU scenario has higher wood availability in the short term (all stands harvested at 35 yrs), but less wood available in the long run

Non-traditional wood production species - if considered, an increase over 18 million m³ could be expected in Mob3
04 Simulation results

Harvested volume

These results disregard the occurrence of hazards. Extrapolations for long-term analysis should be carefully done.
Final remarks and future steps

CONCLUSIONS

StandsSIM.md/SUBER were able to simulate the impact of different FMA/prescriptions, therefore can be used by forest managers in decision making.

DISSEMINATION

FORESTERRA ERA-NET FINAL CONFERENCE
CAFÉ COM CIÊNCIA, FOREST RESEARCH CENTRE
IUFRO 125TH ANNIVERSARY CONGRESS 2017
8º CONGRESSO FLORESTAL NACIONAL
FCTools WEBPAGE

CASO DE ESTUDO SOBRE OS INCÊNDIOS DE GÓIS, FREGUESIA DE ALVARES

Host a PhD student running simulations for Mediterranean plantations who wants to use StandsSIM.md and test the Stakeholder-defined FMAs.

Project application to produce a web-version of the stand level StandsSIM.md for users (certification purposes)

www.simwood-project.eu
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THANK YOU!

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