The economical sustainability of cork forest systems requires the implementation of management techniques using complex decision support systems that combine stand, tree and cork parameters. Cork is the most valuable product of this system; cork production that ensures both an increase in quality and quantity is fundamental when establishing a purchase price. Stoppers of natural cork are the most valuable product in the cork industry and the commercial value of cork is determined by its suitability for the production of stoppers. As a result, cork quality is mostly determined by its porosity (PEREIRA et al 1996) and density (FONSECA et al 1994) since these features have a great influence on the closer capacity of the stopper (GONZÁLEZ-HERNÁNDEZ et al 2014).

**Objective:** Understand the influence of tree features and stand structure and density (high precision tree x, y and z coordinates) in the quality features of the produced cork, specifically density and porosity.

**RESULTS & CONCLUSIONS**

- 11 samples from each of three permanent plots located in Herdade da Machoiqueira do Grou, in Chamusca (n=33).
- Data from cork oak plantations measured in 1996 (RIBEIRO 2007):
  - Dendrometric features
    - Capi: Circumference at breast height before debarking (cm)
    - HT: Total height (m)
  - Tree variables
    - Abi: Basal area before debarking (m²)
    - PCS: Total dry weight cork (Kg)
    - EF1.3: Thickness of the cork in the tree (cm)
    - CD: Debarking coefficient
  - Stand variables
    - NT: Absolute density (N° trees/ha)
    - ACT: Horizontal projection area of total canopy (m²/ha)
    - ABT: Total basal area (m²/ha)

Table 1 shows the mean values of the analyzed characteristics, density and porosity, in all the cork samples.

<table>
<thead>
<tr>
<th>Plots</th>
<th>Mean density (g/cm³)</th>
<th>Minimum density (g/cm³)</th>
<th>Maximum density (g/cm³)</th>
<th>Heterogeneity index</th>
<th>Coefficient porosity (%)</th>
<th>Nº Pores/mm²</th>
<th>Mean area of pores (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.148</td>
<td>0.080</td>
<td>0.261</td>
<td>0.036</td>
<td>6.8</td>
<td>0.050</td>
<td>1.3</td>
</tr>
<tr>
<td>2</td>
<td>0.146</td>
<td>0.078</td>
<td>0.257</td>
<td>0.037</td>
<td>8.2</td>
<td>0.049</td>
<td>1.7</td>
</tr>
<tr>
<td>3</td>
<td>0.134</td>
<td>0.079</td>
<td>0.250</td>
<td>0.033</td>
<td>8.6</td>
<td>0.060</td>
<td>1.5</td>
</tr>
</tbody>
</table>

The values below independent variables are the standardized coefficients and represent the proportion in percentage that each one contributes to mean density variation, explained by the regression in a positive or negative (-) way.

| NT | ACT | ABT | Capi | HT | Abi | PCS | EF1.3 | CD | HD2 | C70D2 | V70D2 | MDRF1D50 | MDRF1D50 | MDRF1D50 | DDF1D50 | DDF1D50 | MAOF1D25 | MAOF1D25 | R² |
|----|-----|-----|------|----|-----|-----|-------|----|-----|-------|-------|----------|----------|----------|----------|----------|----------|----------|
| 8.90% | 7.10% | (-) | 15.63% | (-) | 23.90% | (-) | 7.25% | 5.46% | 21.98% | 9.79% | 0.504 |

Different competition index used as independent variables (RIBEIRO 2007):

- HD2, C70D2, V70D2, MDRF1D50, DDF1D50, DDF1D35, MAOF1D25.

A multiple regression analysis was used to determine which independent variables (Table 1 and competition index above) explain the variance of mean density (Table 2) and coefficient porosity (Table 3) and the relative contribution of each to the total variance explained.

| NT | ACT | ABT | Capi | HT | Abi | PCS | EF1.3 | CD | HD2 | C70D2 | V70D2 | MDRF1D50 | MDRF1D50 | MDRF1D50 | DDF1D50 | DDF1D50 | MAOF1D25 | MAOF1D25 | R² |
|----|-----|-----|------|----|-----|-----|-------|----|-----|-------|-------|----------|----------|----------|----------|----------|----------|----------|
| 10.78% | 6.68% | (-) | 14.31% | 4.56% | 4.22% | 9.89% | 8.79% | 12.92% | 25.85% | 0.338 |

Coefficient porosity = -2.55551 + 0.006854 NT + 0.00368 ACT – 0.50100 PCS + 1.91012 EF1.3 + 4.97958 CD + 4.85258 HD2 - 2.33062 V70D2 + 1.67087 MDRF1D50 - 0.33279 DDF1D35.

- The percentage of mean density variance explained is mainly due to DDF1D50, showing that closer trees may produce cork with higher mean densities.
- With a high percentage of variance explained, coefficient porosity is negatively influenced by DDF1D50: more distance between trees originates more porous cork.

This results mainly show the influence of the stand density in the quality of the produced cork and so the importance of management techniques according with the desired objective, in this case, production quality of cork.