A ten years analysis of cork oak (*Quercus suber* L.) afforestation projects in the Mediterranean region of centre-eastern of Portugal

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Abstract

Portuguese forest area has a great expression being around 39%. Since the last centuries the *Quercus suber* L.(cork oak) areas have increased, reaching to 715 922 ha (23%) according to the last National forest inventory. Afforestation programmes financed by the European Union and the existing protection laws for the species are one of the main reasons for this increase. These efforts are important to promote for these stands a distribution by age class that ensure cork oak forest sustainability (only 14% of the existing even-aged stands are young stands with less than 10 years). In this study, the programme – Afforestation of Agricultural Land – in the region of Beira Interior Sul was analysed, to assess afforestation success during the period of 2001 to 2011.

The information was gathered from 164 projects established which represent an afforestation area of 3363.04 ha. These afforestations were mainly of pure cork oak stands (54.2%) and mixed stands of cork oak with coniferous (23%). Detailed data was collected from field samples in 97 projects to assess if minimum stand density was observed, along with information concerning to previous land cover, stand regeneration, site preparation, species, stand composition, elevation, soil type and depth, individual tree protection, fences, animal damage, among others. Once more, field samples (1640.75 ha) were mainly of pure cork oak stands (47.6%) and mixed stands of cork oak with coniferous (26.6%). The Principal Components Analysis (PCA) was used to find out which variables were the most significant on explaining afforestation success and failure.

Field samples proved that a regular status was found in 71 of the 97 projects analysed. The irregular status, observed in the 26 remained projects, was due to the lack of minimum stand density (73.1%) or to the deficiencies in meeting the management plan goals. When analyzing afforestation success and failure through the PCA technique, both 1st and 2nd principal components explained around 50% of data variability which points out that other parameters must be included.

The results of PCA suggested that afforestation will not succeed in mountain areas (elevation between 700 to 1000 m), in sandy and superficial soils (< 30 cm), using mixed compositions and without any kind of animal damage tree protection. On the other hand, afforestation success seems to be ensured in sites of low elevation (0 to 400 m), previously occupied by olive orchards, in granitic and depth soils (> 60 cm) and when animal damage tree protection is used. These findings are of great help for planning future afforestation in the region. They can also be used as guidelines for other similar Mediterranean regions. Nevertheless, other parameters such as those related to climate and to site should be analyzed in future studies.

Key words: *Quercus suber* L.; Afforestation projects; Principal Components Analysis; Afforestation success