

## Conversion of unproductive eucalyptus stands in Bragança, Portugal

A landowner is focusing on planting native cork oak species to convert unproductive and low-productivity eucalyptus plantations, taking advantage of the shade provided by some rows of the latter.



Landscape image of the properties when the conversion was initiating (2004/2005) | Author: JGA© | © JGA©

### /// Context ///

In the context of climate change, the decline in productivity of some forest species is becoming an increasingly important issue. This is a problem that can be observed in several eucalyptus plantations in the Trás-os-Montes region of Portugal, such as the present case study in Bragança.

Planted in 1988, after ten years of growth, the volumes were estimated to be between 3.5 and 5 m<sup>3</sup>/hectare/year, a very low value for eucalyptus plantations intended for pulp production and therefore considered unproductive forest stands. Finding alternative forest management proposals based on forest species adapted to the edaphoclimatic conditions is a crucial contribution to landscape resilience.

In anticipation of greater profitability, it was decided to convert some areas to cork oak as the main species, at a density of 600 trees/hectare. The conversion is planned to be gradual in space and time, with only two of the three existing eucalyptus lines being removed initially. This not only guarantees the benefits of the remaining tree cover, particularly in terms of soil protection, but also provides shade for the new cork oaks, which is beneficial for the development of the species in the early stages of growth and particularly in view of the recurrence of extreme heat waves in summer. The conversion process involves various costs, including those related to the extraction of timber, the reconstruction of the land structure and the road network affected during the eucalyptus harvest.

### /// Solution for a Resilient Future ///

In the northern region of Portugal, eucalyptus is the second most representative species, occupying around 164 thousand hectares. This area increased by 8.5% between 1995 and 2015. The great interest in the *Eucalyptus globulus* species is linked to its high profitability when explored for pulp production, and obtained with a rotation period of 9 years. However, the progressive change in soil and climatic conditions has shown that the productivity of eucalyptus is decreasing. In Trás-os-Montes, production values have been estimated between 9 and 12 m<sup>3</sup> ha<sup>-1</sup> year<sup>-1</sup>. At present, however, it is difficult to find settlements with a productivity greater than 50% of these estimates made in the 1990's, and many areas are left without forest management, increasing the risk of forest fires spreading across the landscape. This was a problem faced by Quinta do Zimbro, a company responsible for managing a group of properties in the Bragança district.

The two forest inventories carried out during the first 10 years after planting (1988-1998) showed productivity values between 0.9 and 3.05 m<sup>3</sup>/hectare/year, well below the investment expectations. An alternative that has been tested on this farm, with the aim of improving the productivity of these forest areas, is the conversion of the stands to cork oak forest areas as the main species. The aim is to achieve, through gradual conversion, a cork oak forest with an average density of 600 trees/hectare. The conversion will be gradual, with only two out of three rows of eucalyptus trees being removed initially. Due to the reduced volume of eucalyptus wood suitable for pulp production, most of the removed forest biomass was incorporated into the soil. The remaining rows of eucalyptus will not be removed until 5 to 6 years later or later, depending on stand development. This strategy allows some forest cover to remain on the land, which protects the soil, but also increases the shade provided to young cork oak plants that grow in the space left by

the removal of the eucalyptus trees. This is an important factor for the survival of the young trees at an early age, and also for the formation of the straight trunks of the cork oaks that will be most suitable for mechanical harvesting of cork (a subject dealt with in another fact sheet).

During the first years, the development of the forest plantation will be evaluated according to the existing empirical and scientific knowledge of the cork oak. This will make it possible to draw up a technical plan to guide the management of the plantation and to define the most appropriate measures. One of the most important aspects is the monitoring of the nutrient potential of the soil. Although it is expected that the incorporation of eucalyptus harvest residues into the soil will have a positive effect in the initial phase, it will be necessary to assess the need for soil correction.

An initial fertilisation, based on a prior soil analysis, will ensure the minimum conditions for the positive development of the plantation. This is a particularly important operation given the difficulty in assimilating

macro- and micro-nutrients due to the acidic nature of the existing soils. It is planned to use a compound fertiliser (P+K+4% MgO+B+32% Ca) Fertifos 021. The fertilisation will be carried out by covering and localised application of 100 g per plant. The aim of this fertiliser is to obtain the following benefits:

- Increased resistance to cold and frost (K).
- Encourage a rapid and vigorous start to the crop (P).
- Encourage root development without creating an imbalance with the aerial part, using a greater volume of soil (P).
- Promote the soil's ability to fix phosphorus, as it is a local fertilisation. When the local fixation capacity is saturated, immediate availability to the plant is favoured (P).
- Favours photosynthesis (Mg).
- Correction of calcium deficiency.
- Favoring the exchange complex (Ca).
- Stimulation of various vital phenomena (B).



Landscape image of the properties when the conversion was initiating (2004/2005).  
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Scope of the ResAlliance project's portuguese LivingLab (green). Location of Quinta do Zimbro, near Bragança. | Author: Paulo Firmino | © Educational use, non-commercial.

### /// Always Moving Forward ///

Converting unproductive eucalyptus land into cork oak forests involves investment and maintenance costs that cannot be ignored. At the structural level of the land, the removal of woody material is a time-consuming and resource-intensive forestry operation. This operation will not provide a large volume of timber to fully recoup the investment in the short term, and the eucalyptus wood has a low demand in the region. In addition, in some situations it may be necessary to reinforce the soil as a result of this operation. The road network, which is in excellent condition, will also be affected by the operation and may require future repairs.

Interventions related to the establishment and

maintenance of the stand include the use of individual protection, the replacement of dead trees, periodic soil analysis and the first fertilisation. The first few years after planting are monitored with technical rigour, so that a management plan can be drawn up in good time, taking into account the possible interventions that the species requires (e.g. training pruning).

Due to associated limitations, the conversion has been gradually done, helped with financing obtained by submitting operational projects to funding programs (PDR2020, Fundo Ambiental) and the last Eucalyptus rows are expected to be removed in a near future.

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