



Cause of the decline of cork oak forests and management strategies

Introduction

The cork oak stands when managed as an agro-forest-pastoral stand creates an ecosystem called “Montado” (Portuguese)/ “Dehesa” (Spanish). This ecosystem allows the creations of different products (timber, livestock, cork, ...) and services (carbon sink, biodiversity, water regulation, ...). For these reasons this ecosystem has a major impact in the national landscape, environment and economics.

In the last decade the geographic distribution of this species has been changing, and the density of the current stands has been declining because the decrease in vitality/increase in mortality and the low success rate of the natural regeneration and the young plantations. The three main reasons are climate change, pests and diseases, and bad management practices. They don't act alone but in an interconnected way since their effects influence each other. In relation to climate change, the current scenario is characterized by higher temperatures all year round, less precipitation with higher periodicity and in events of higher amount of rain. These factors have as consequences the tree growth starting earlier in the year but also finishing earlier, forest fires are becoming more common, and drought events are becoming more common and intense. In relation to pests and diseases, the increase in their severity is related to better climatic conditions for their growth and reproduction and the more and more common monospecific forests lead to more vulnerable stands. Most of times pests and diseases do not kill the tree, but when in conjugation with other factors, such as droughts, it may. In relation to the bad management practices, it is usually associated with the mobilization of the soil, since ploughing breaks the superficial tree roots (most of the water and nutrient capture is done by them) and contribute to the dispersion of fungi spores, the compaction of the soil, done by the machines and excessive cattle, creates difficult condition for root development, the presence of livestock also decreases natural regeneration and their success, the lack of under story vegetation control may create excessive competition between the trees and other plants, however the lack of under story vegetation may also impact the natural regeneration, since they create better climatic condition (shade, lower soil temperatures) for the growth of young plants.

As a solution for this problem two school of thought may be used but remember they should be viewed as a spectrum and not two isolated options. Resilience measures aims to increase the resistance and recovery potential of already established stands to the new climate and natural disturbances. Allowing the

ecosystem to endure and keep their characteristics. In the transition school of thought the objective the creating of a new ecosystem more adapted to the foreseen condition that are the result of the climate change scenarios.

Three main objectives that should be targeted when creating and applying forest policies and management operations to fight the decline of vitality in cork oak stands. The objectives are:

- (1) Maintaining the fundamental ecologic functions
- (2) Maintaining and improving the genetic diversity
- (3) Improving the ecosystem fitness by mixing and transitioning to new species.

To achieve the first objective management practices should aim to decrease the effect of droughts, reduce the impact of the operations and the climate change in the soil and in the nutrient cycle.

To improve and maintain the genetic diversity, the promotion of natural regeneration will allow the growth of plants more adapted to the site, however given the current climate change, plants from different spots, with the genetic potential to resist more severe conditions, may be more adapted.

The ecosystem fitness can be improved by mixing new species in the stand that are more resistant to harsher conditions (higher temperatures, less precipitation) or use the available resources in a different way than the current tree species.

Lessons learned

The management practices that are suggested to fight the decline of cork oak stands are:

- (1) The reduction of stand density, when the competition between trees is a limiting factor
- (2) The promotion of the stand heterogeneity in terms of structure/age and species, allowing the formation a more resistant stand
- (3) The control of spontaneous vegetation using methods that don't mobilize the soil, allows a decrease in competition and don't reduce the quality of the soil
- (4) The monitoring and correction of the soil pH and nutrients increases the quantity and availability of nutrients to the plants, allowing them to be more vigorous
- (5) The correct number of live stoke animals per area or even their exclusion for a period of time in some plots will lead to an increase in natural regeneration success rate.

The study of cork oak growth and survivability from different regions and countries is of extreme importance. When more knowledge about this topic becomes available better and more informed choices can be made about what plants/seeds should be used for a certain plot.

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Further information

<https://www.unac.pt/index.php/id-i/grupos-operacionais-accao-1-1-pdr2020/geosuber>





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