

## Field sampling methods for cork value evaluation before cork debarking



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### Keywords

sampling methods

Cork quality

Cork thickness

cluster sampling

zigzag transect

cork

Quercus suber

### NWFP

Cork

### Scale

Sub-continental

### Context

Cork prices depend on its quality and thickness, ensuring the production of high-quality wine stoppers. It is very important to have a forecast of the cork value before its extraction. The Portuguese Forest Service supported the application of a sampling based on selecting trees along a zigzag transect. This method had some weaknesses from both statistical and practical standpoints. Thus, other alternative methods were pursued, looking for a compromise between sampling precision and costs, comparing plots with different fixed radii or number of trees of different sizes.

### Objective

The objective of the current work is the analysis of alternative sampling methods and intensities for estimating cork value before its extraction (price per unit of weight), considering the trade-off between sampling precision and costs. The dataset includes 30 sampling clusters for each of the 6 stands, where the measurement of the tree coordinates in each plot allowed for the simulation of several sampling methods and intensities, and the comparison of the percent errors and sampling costs.

## ✓ Results

- The zigzag transect was applied within a homogeneous Montado area. Its length was obtained by dividing the size-area by the total number of sample trees. The trees selected were closest to the sampling points defined at equal distances on the line. The sampling error is high but the transect can be implemented in a day.
- To decrease the sampling error from 15% to 10%, the sampling time must increase by 49%.
- The high variability of cork value among trees in the same stand suggest the use of cluster sampling, where the cluster is a group of neighbouring trees.
- The single-stage cluster sampling is more efficient than random sampling of the same size and guarantees a reasonable sampling error ( $\leq 15\%$ ), compatible to one day of work.

## 💡 Recommendations

The estimation of cork value before its extraction is very important to forest landowners. Cork sampling is recommended to be accomplished following the specific sampling procedures presented. Since this procedure implies additional costs, its optimisation regarding the number of clusters and trees sampled should be considered.

The recommended number of trees per cluster is five to seven. If data from prior samplings are unavailable, the number of clusters should be between 20 and 30. Otherwise, the previously available information will be used to determine the number of clusters (Figure 2).

## ⚠️ Impacts and weaknesses

Market trends have a major impact on the forest landowner economy, so it is essential to forecast cork value as a basis for negotiation with buyers. The main restriction in conducting cork sampling is to ensure cost effectiveness combined with good precision (low error). The procedures that follow cork sampling (cork sample boiling, sample preparation and cork classification), which are responsible for the evaluation of cork quality in each tree sample, are relevant and require the work of experienced personnel. It is very important to ensure the training of these experts.

## ➔ Future developments

Cork sampling anticipation before the debarking year, while applying the SUBER model, allows the prediction of cork thickness. Thus, it is possible to negotiate cork price during winters and consider postponing extraction if the average calliper is thin.

Another management option to be considered is the accomplishment or postponing of stand thinning in the first year of cork extraction. According to Faias et al. (2019), this thinning operation can be postponed until the second debarking, since at that stage, tree cork quality can be assessed and trees to be removed can be selected according.

- a)  $n = \frac{s^2 \cdot 1.946}{\bar{x} \cdot E\%/100}$ , where  $s^2$  is the variance and  $\bar{x}$  is the mean from the previous sample.
- b)  $n = \frac{s^2 \cdot z_{\alpha/2}^2}{\bar{x} \cdot E\%/100}$ , where  $s^2$  is the variance and  $\bar{x}$  is the mean from the previous sample.

Formulas to determine the number of clusters to sample. (Margarida Tomé)

## Further information

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### About INCREDIBLE Project

INCREDIBLE project aims to show how Non-Wood Forest Products (NWFP) can play an important role in supporting sustainable forest management and rural development, by creating networks to share and exchange knowledge and expertise. 'Innovation Networks of Cork, Resins and Edibles in the Mediterranean basin' (INCREDIBLE) promotes cross-sectoral collaboration and innovation to highlight the value and potential of NWFPs in the region.



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