

# CORK QUALITY ASSESSMENT TRAINING

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**CORK INET**  
**SCIENCE TO PRACTICE EVENT**  
**OCTOBER, 2020**

# CORK QUALITY ASSESSMENT TRAINING

**Cork quality assessment in the field - experience from Portugal and Spain**  
**How to use it in other regions?**

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## Objective of cork quality assessment (1/2)

- ❑ The main objective is to give the landowner / forest manager some support for the **cork price negotiation**
- ❑ Three methods mainly used for the cork trade:
  1. Before cork extraction: the buyer offers a price for the amount of cork that he will extract from the stand (**M1**)
  2. After cork extraction with a cork pile: the forest owner is responsible for cork extraction, cork is set up in a pile and the amount of cork is weighted (after 21 days) or estimated from the pile volume (**M2**)
  3. After cork extraction without a cork pile: the forest owner is responsible for cork extraction, cork is weighted immediately after the extraction (fresh weight) (**M3**)



## Objective of cork quality assessment (1/2)

- ❑ The methods for **cork trade** have two sources of “**lack of transparency**”:
  - **Cork weight**: no estimate of cork weight is used in M1, M2 can have a reasonably correct estimation of cork weight and M3 has the problem to “convert” fresh weight in air dried weight (or dry weight, but this is not much used to fix the price)
  - **Cork quality**: once we have cork weight, the price per weight unit (@=15 kg) strongly depends on cork quality
- ❑ The main objective of the cork quality assessment in the field is to **provide information on cork quality “translated” into a cork price**



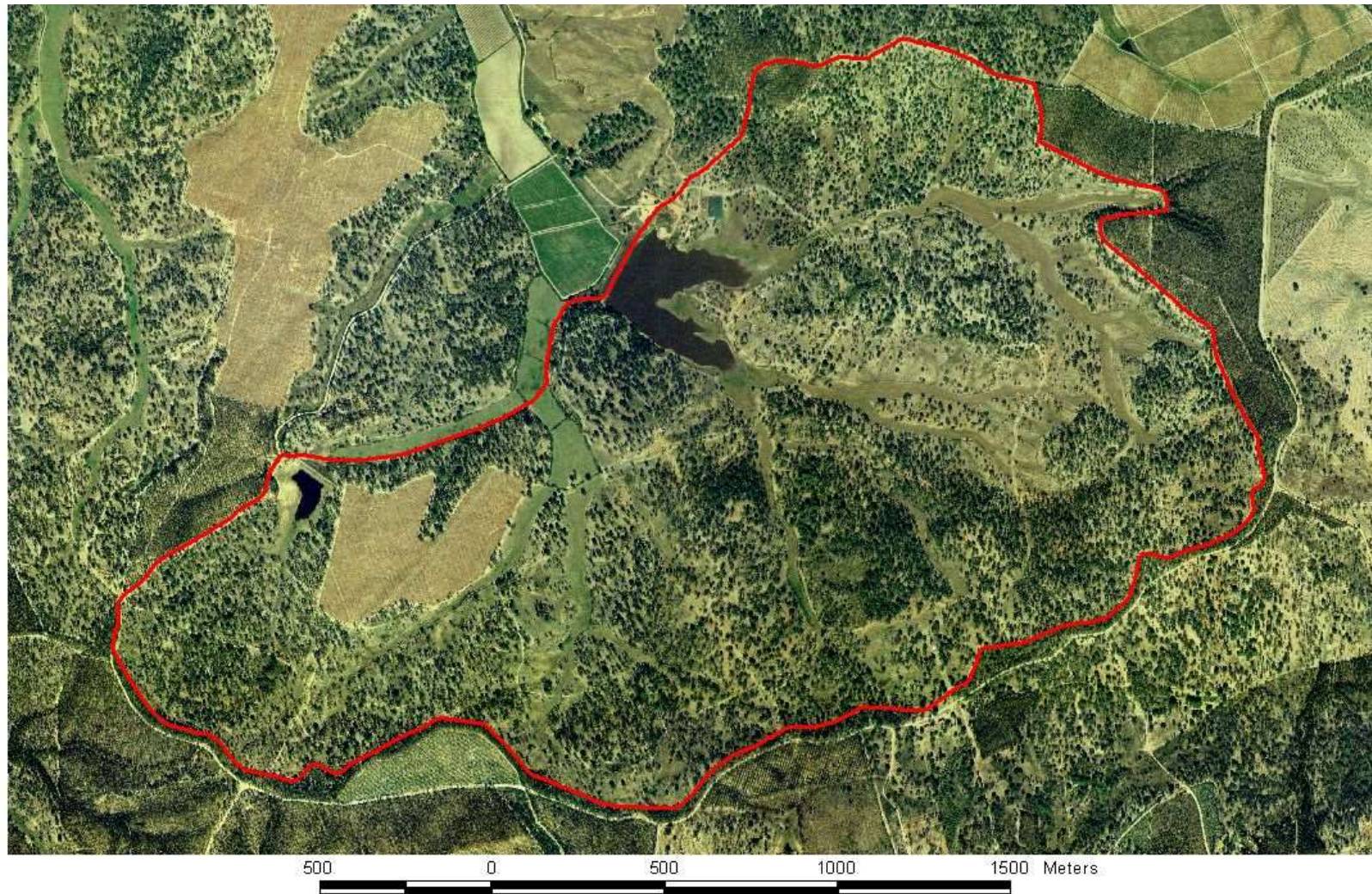


## Field assessment of cork quality in Portugal

- ❑ The sampling scheme for cork quality/price estimation prior to extraction was designed in 1992 by the Forest Service, following the Spanish experience
- ❑ It was based on the sampling of individual trees along a **zig-zag transect** (50-60 trees)
- ❑ This sampling scheme was soon implemented by some Associations of Land Owners

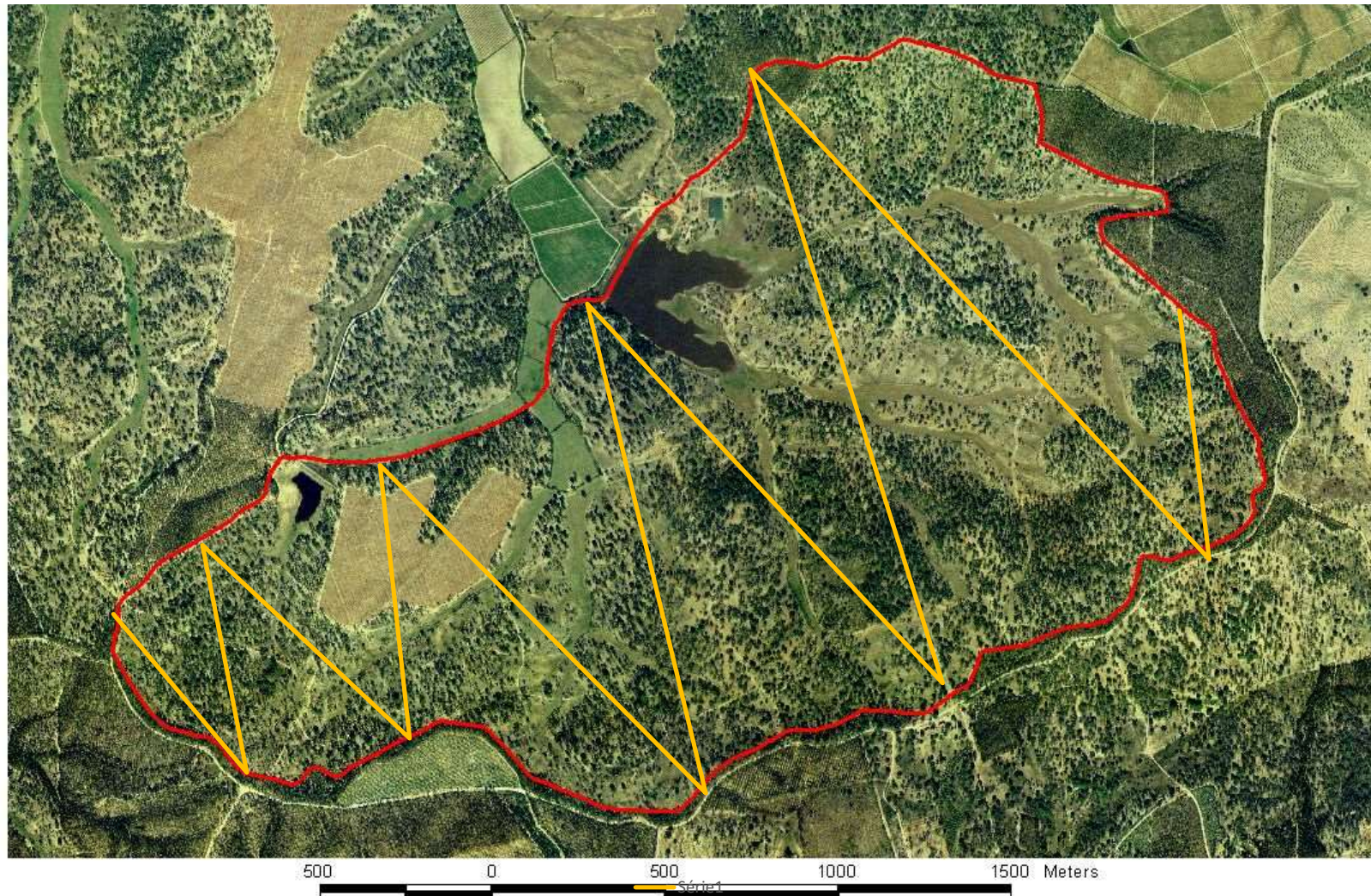


## An example of a stand





## Sampling individual trees along a zig-zag







## Field assessment of cork quality

- ❑ Two methods were used at that time:
  - Each tree crossed by the zig-zag was selected as a sample tree
  - The zig-zag transect was segmented in portions with  
$$\text{length} = (\text{total zig-zag length}) / (\text{number of sample trees})$$

The tree closest to the end of each segment was selected as a sample tree
- ❑ A 20x20 cm cork sample (*cala*) was extracted from each sample tree, total cork thickness (*calibre*) was measured before and after boiling and cork visually classified by an expert in one of 6 quality classes





One  
"cala"



## Field assessment of cork quality

- ❑ Price of each *cala* was defined as a combination of *caliper* and *quality* and stand cork price estimated as the average of the individual cork samples price
- ❑ At that time, no sampling error was calculated



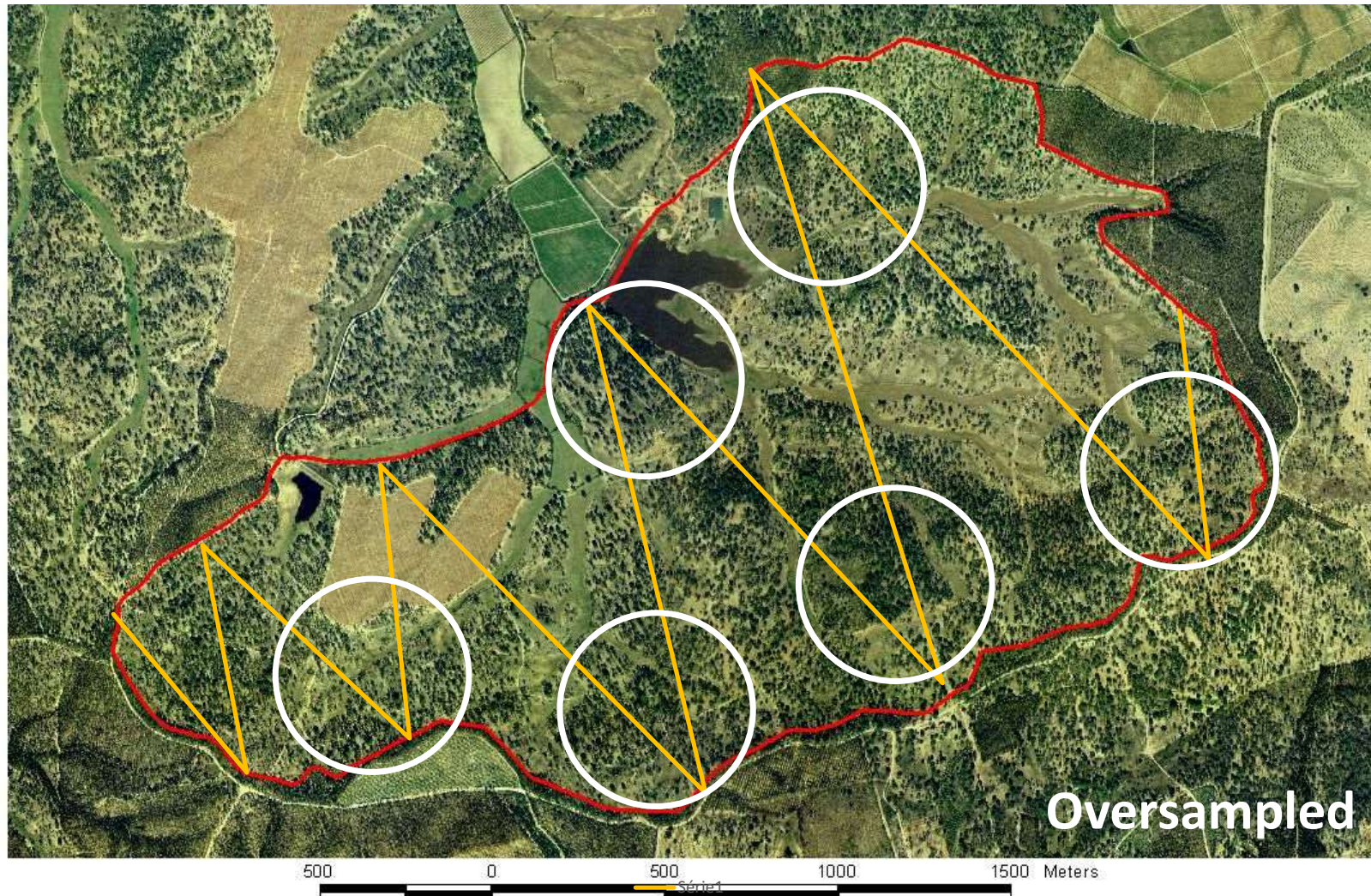


## Problems with the initial design

- ❑ The **initial sampling design** had some **problems**
  - sampling error was usually too high, therefore requiring a bigger sample size
  - but it would be difficult to increase sample size
    - ✓ it is a hard task to carry the 50-60 cork samples along the transect
    - ✓ it would imply another day of field work, implying to double the price
  - the data were not the most appropriate to estimate area-related stand characteristics (important to plan forest management)
  - Some parts of the stand were not covered (biased sample)

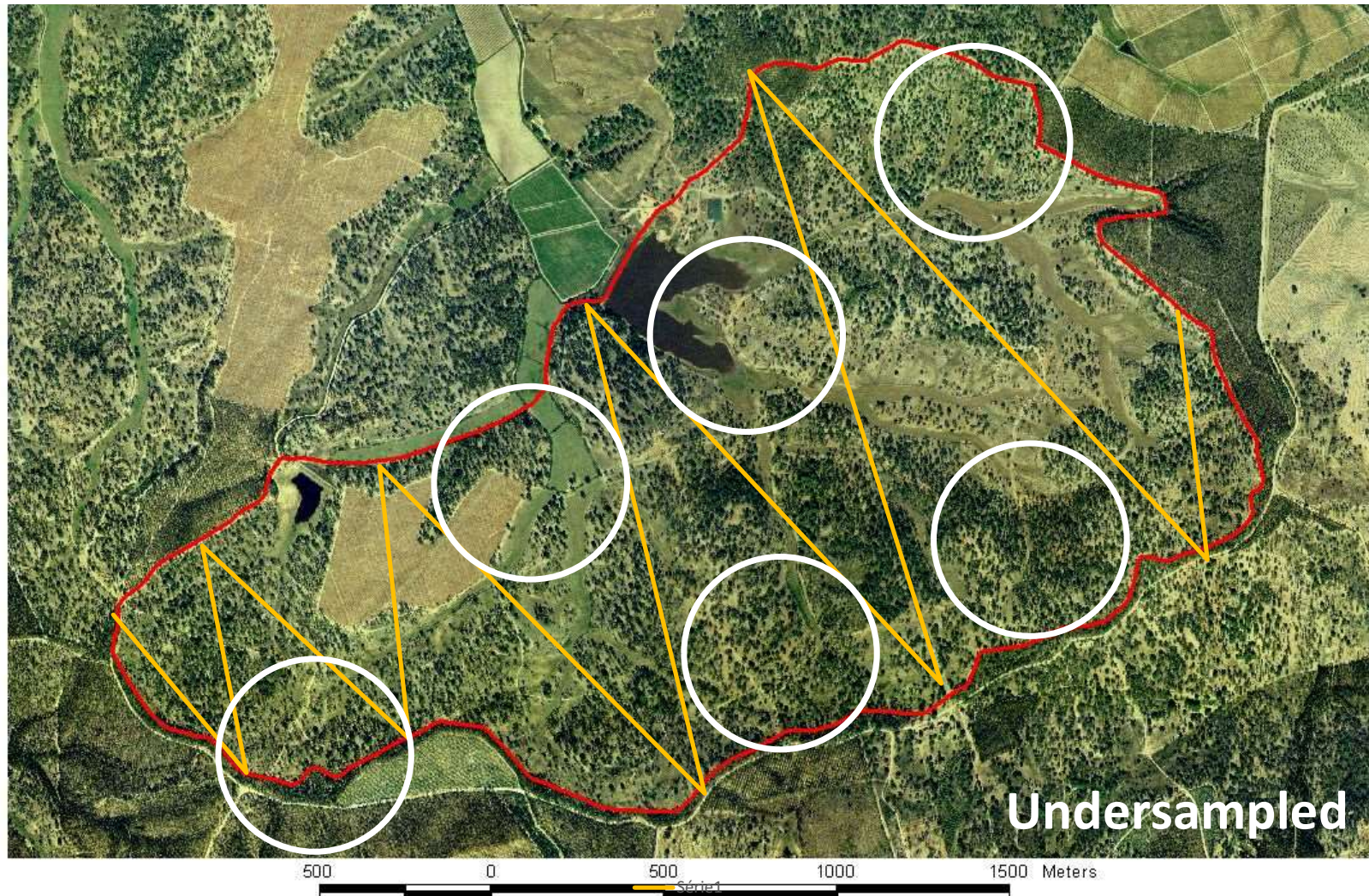


## Sampling individual trees along a zig-zag





## Sampling individual trees along a zig-zag





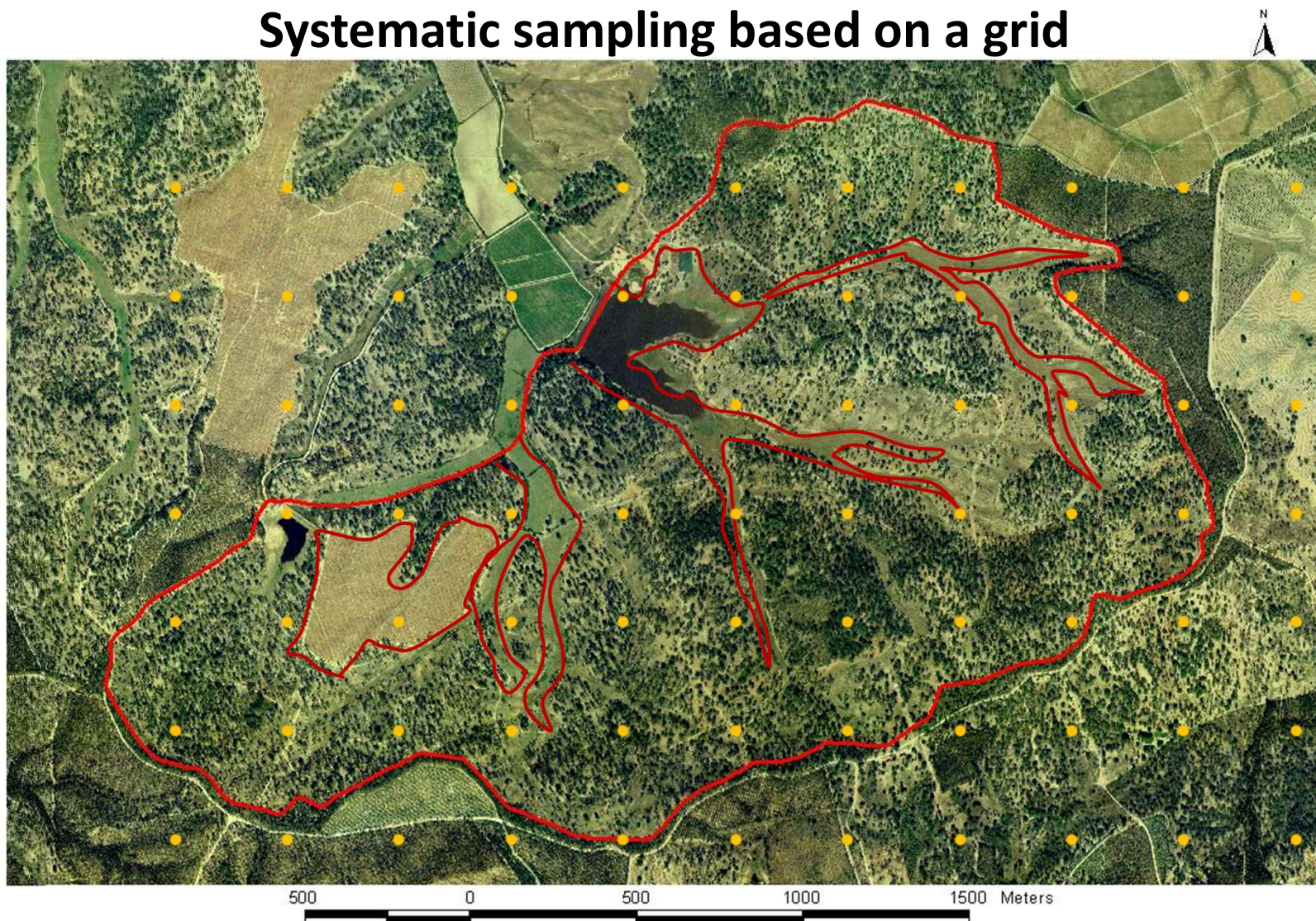


## Problems with the initial design

- ❑ These problems gave impetus to the study of an **alternative sampling design** based on field plots
- ❑ The sampling is usually carried out at the stand level, one sampling for each stand
- ❑ If needed, the sampling can be applied to more than one stand and results treated as a stratified sampling
- ❑ The first decision was to **substitute the zig-zag transect** by a **systematic grid**, in order to obtain a representative sampling



## Systematic sampling based on a grid







## Comparing alternative sampling designs

- The main research topic is to find the best sampling unit:
  - Individual trees?
  - Plots of  $n$  trees? How many trees?





## Comparing alternative sampling designs

- ❑ The research was based on the sampling of several stands in which two samplings were planned:
  - The traditional zig-zag
  - Cluster sampling based on a systematic grid
    - ✓ a cluster included the  $k$  (maximum 20) trees closest to each grid point
    - ✓ azimuths and distances from the centre were measured for each tree from a cluster in order to be possible to simulate clusters of increasing number of trees

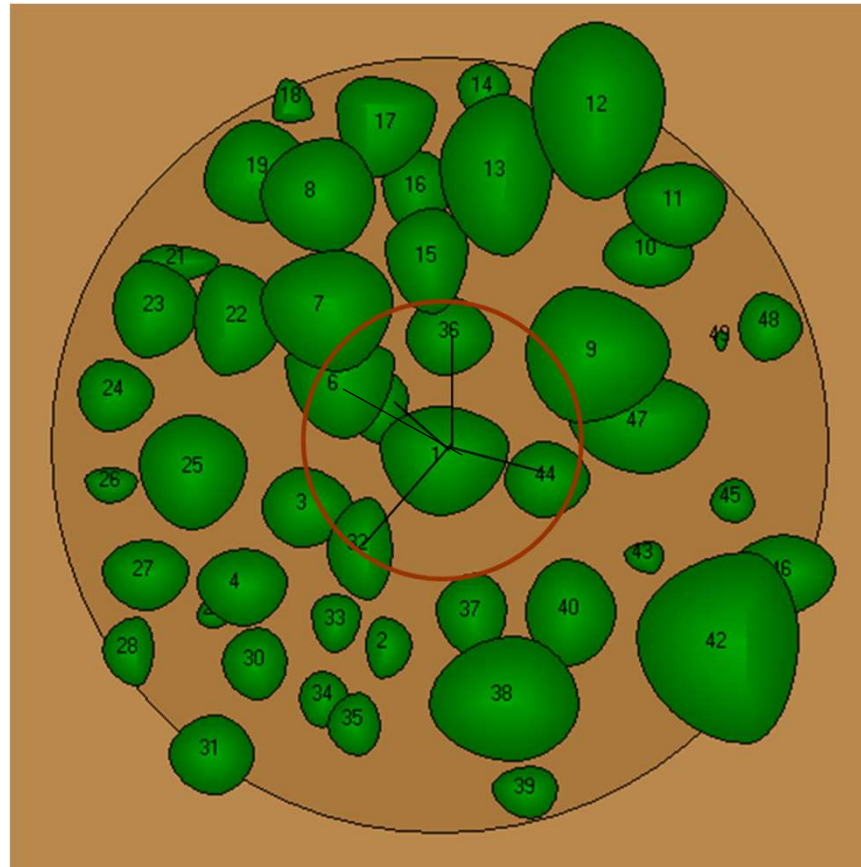


## Comparing alternative sampling designs

- ❑ The data collected in these samplings allowed the study of the distribution of cork quality within each stand:
  - An aggregated distribution would indicate the need to sample many plots with a small number of trees
  - A random distribution would indicate the need to sample a small number of plots with many trees
- ❑ The simulation study allowed the computation of the sampling error for the samplings with different number of plots and of trees per plot



Each of the  $k$  trees closer to the plot center is identified and measured and cork is sampled by extracting one “cala”





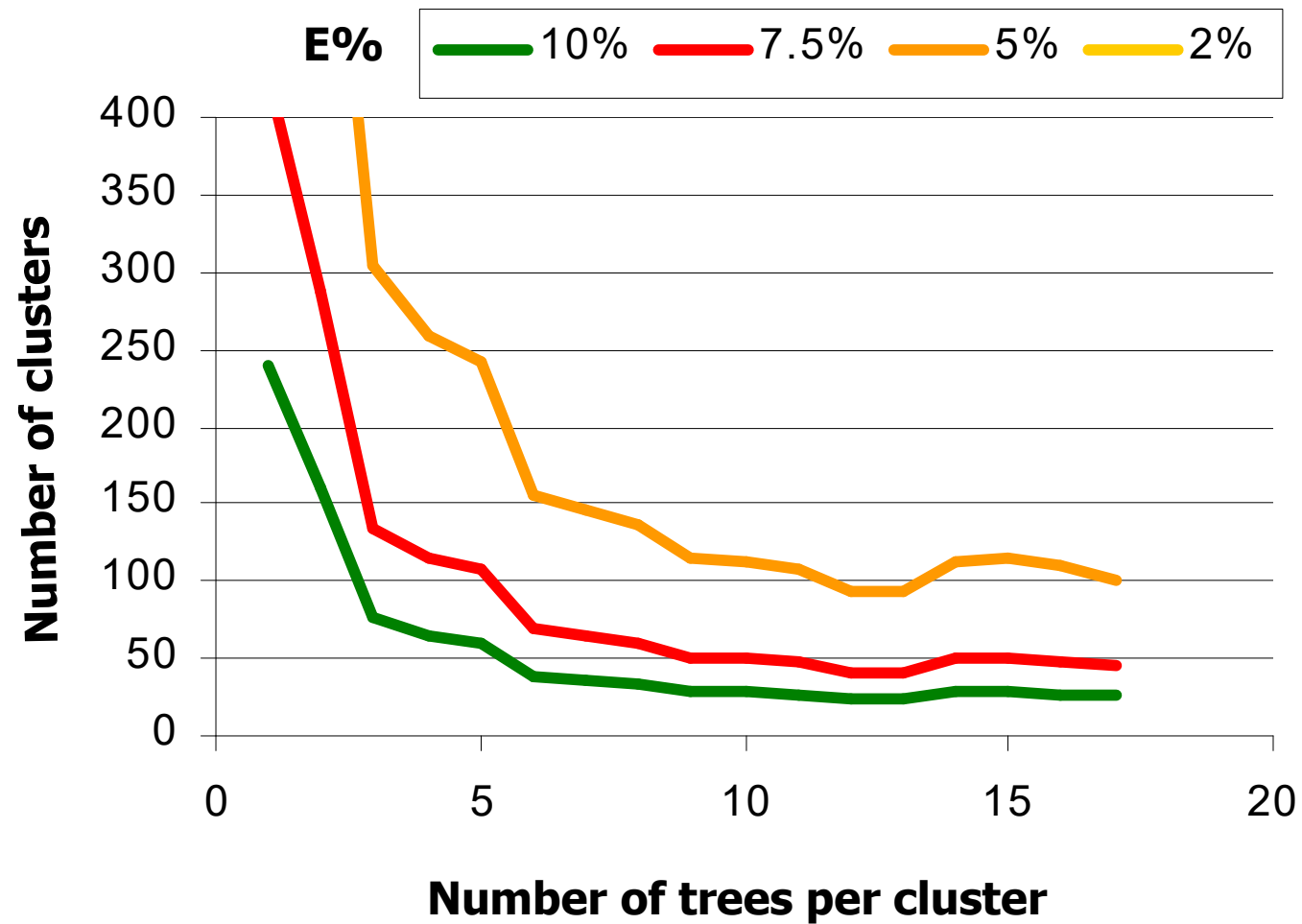
## Comparing alternative designs

- ❑ By using a grid of plots instead of a zig-zag transect with the sampling of individual
  - it was possible to establish a fixed-radius plot around each grid point in which all the trees were measured to estimate area-related information
  - data could also be used to simulate plots with a fixed number of trees



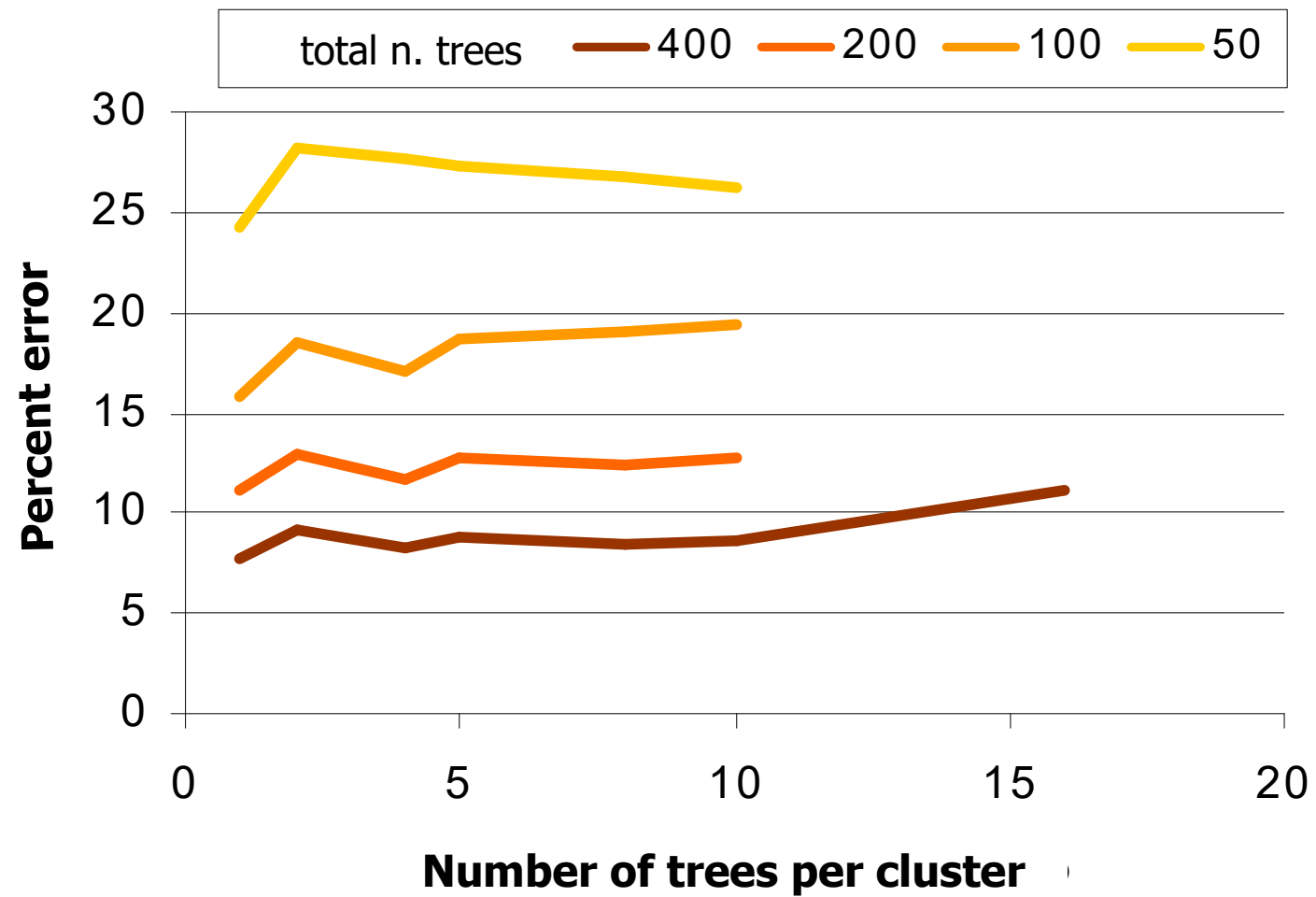


## Results – sampling error





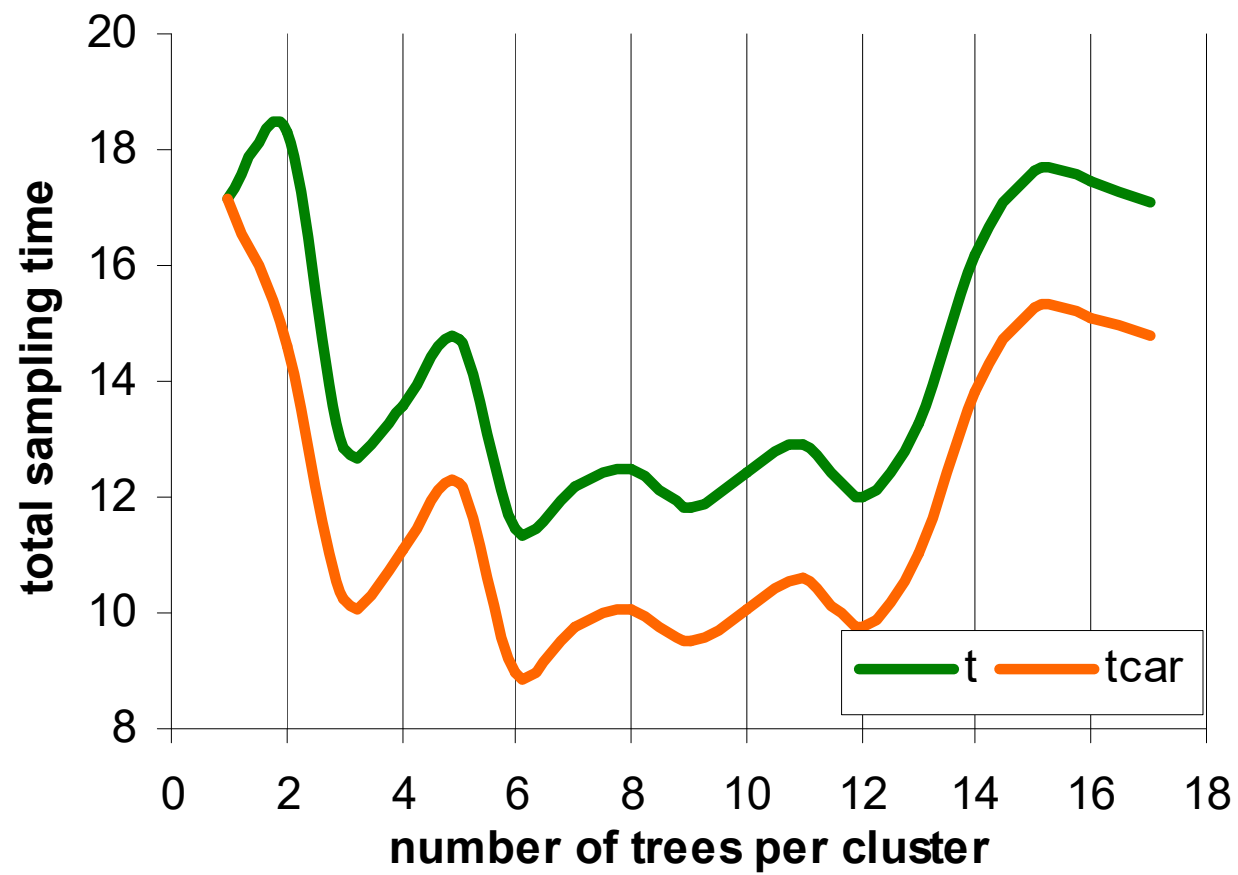
## Results – sampling error







## Results – total sampling time





## Conclusions based on 4 stands

- ❑ It was possible to substitute the traditional zig-zag sampling by a single-stage cluster sampling without loss of precision and, in most cases, with less time consumption
- ❑ Single stage cluster sampling is now being used by the Associations of landowners. Most of them adopted clusters of 5 trees
- ❑ The possibility of measuring sample plots coinciding with each sampling unit to estimate area-related characteristics is an additional advantage of the use of single-stage cluster sampling



## Referências bibliográficas

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