

Use of hemispherical photography to quantify changes in leaf area index after thinning of chestnut coppices in Ticino, Switzerland

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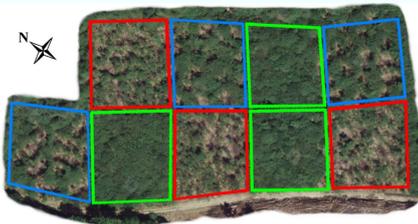
Goals

Overall goal: to test silvicultural interventions for the production of high quality chestnut timber

Specific goal: to assess foliage density and regrowth after two different thinning treatments

Sites and experimental design

- 3 sites: Bedano, Gerra, Pura (2 further sites in Tuscany, Italy, not detailed here because of different methods for LAI measurement).
- Block design with 3 replications on each site.
- 3 treatments: **A** = single-tree-oriented thinning (100-150 trees /ha), **B** = stand-oriented thinning and **C** = control.
- First thinning 8-9 years after clear-cut.



Map of the Pura site ¹



Map of Switzerland ¹



Map of the sites ²

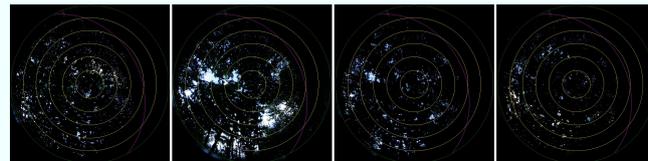
1. pixmaps © 2014 swisstopo (5704 000 000)
2. © OpenStreetMap contributors



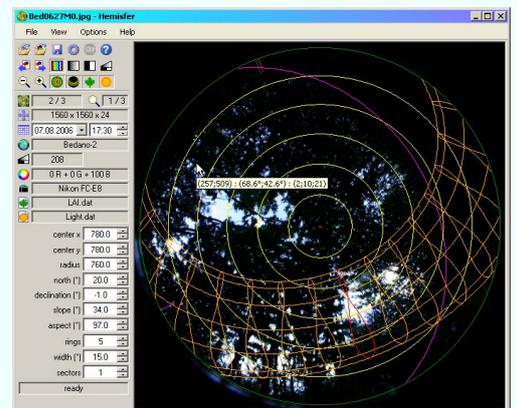
Camera with hemispherical lens

Hemispherical photography, LAI

- 9 pictures / plot, taken in Aug. - Sept.
- Manual exposure with bracketing.
- Analysis with software Hemisfer:
 - automatic black/white thresholding,
 - slope and clumping taken into account,
 - batch processing (>3600 pictures so far).



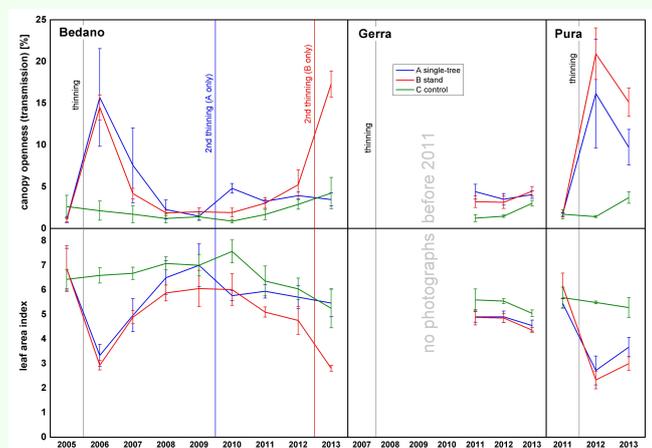
Hemispherical photographs in Bedano: 1 year before and 3 years after thinning



Screen capture of Hemisfer 2

Results

- Hemispherical photography suitable to quantify the effects of thinning on canopy openness and LAI.
- Necessary to correct for terrain slope in LAI estimation.
- Comparisons between years more problematic than between treatments because of unequal weather conditions.
- Roughly half of the leaf area is removed by thinning.
- Canopy openness increases up to ~20%.
- Light interception thus remains high, ~ 80%.
- Recovery of the leaf area within 2-3 years.
- Similar results on the Italian sites (not shown here).



Conclusions

Monitoring the leaf area by hemispherical photography enabled us to show that even a heavy removal of foliage does not impair much the light interception by the trees. Decreases in LAI in the control plots during the last years are statistically not significant but probably linked to gall wasp invasion (*Dryocosmus kuriphilus*).