COMPARISON OF TWO REMOTE SENSING TECHNIQUES (AERIAL AND TERRESTRIAL) WITH TRADITIONAL FIELD-BASED METHOD FOR FOREST INVENTORY

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INTRODUCTION

To effectively plan sustainable management of forest ecosystems detailed and up-to-date spatial information are needed. Remote sensing platforms equipped with multispectral optical sensors and/or laser scanners allow capturing extremely useful data for the characterization of forest. Depending on the aim, scale, resources and the required accuracy, there are many kinds of forest inventory techniques that can be applied. The object of this work is to compare the integrated use of inventory and of two remote sensing techniques (aerial and terrestrial) with traditional field-based methods to map forest types distribution, vegetation structure and estimation of Sustainable Forest Management (SFM) indicators.

The first case study, based on Airborne-Laser-Scanning data and RGB-images in Rincione Forest (FI) was conducted within the FRESH LIFE project (LIFE14 ENV/IT/000414), whose aim is to demonstrate the technical and economic feasibility of integrating data from forest inventories with information obtained from remote sensing, and to use this approach to develop SFM indicators to help forest managers evaluate sustainable forest management practices. With multispectral optical sensors and laser scanners mounted on SAPR and conventional systems we mapped the forest variables useful to describe the qualitative and quantitative characteristics of forests on the operational scale of forest management.

For the second case study conducted in Amiata forest (SI) we used a Handheld Mobile Laser Scanning ZEB1. The aim was to obtain detailed information for the management and monitoring (precision forestry) of Chestnut forest. We assessed the potential of the HMLS for a detailed inventory of valuable forest areas, in particular for the parameters: Number of trees, position (x,y) of trees, DBH, heights, crown base heights and crown widths.

Study area: Rincione forest (FI), 270ha
- Field survey: One per strip stratified sampling, square areas of 23x23 m
- Field survey: 52 plots of size 150 m2
- Census of live trees, stumps, dead wood standing and on the ground
- Classification of damage and micrometric presence
- The collected data was used for: estimation of volume (m3 / ha) - Classification of forest types - Calculation of SFM indicators
- The study area has been classified into forest types according to the legend of the European forest type and the IDEF Silva forest definition (area min 0.5 ha)
- The forest damage map was produced by photo interpretation since a wildfire occurred in march 2015. Minimum mapping unit is 0.3ha, total 4ha

Study area: Amiata (SI), 35ha
- Field survey: 3 plots (one size of 2627m2 and two size of 6500m2)
- Points of trees
- Stratification attributes of trees
- Classification chestnut variety, damage and crown width

A linear path was designed for the surveys with a range of 10m. We positioned a 2"-grade-plate" metal spheres mounted on poles at fixed distance, as fixed point to locate the path to be scanned. The path was surveyed with a flight on the opposite direction of the path with the center point of the survey, with a GPS Trimble (9060).

Results and Map