

Social Forest Planning

Tuomas Häme ⁽¹⁾ , **Ilkka Korpela** ⁽²⁾ , **Aarne Hovi** ⁽²⁾ , **Ismo Hipp** ⁽³⁾ , **Jussi Rasinmäki** ⁽⁴⁾
Matthieu Molinier ⁽¹⁾ , **Kaj Andersson** ⁽¹⁾

⁽¹⁾ *VTT Technical Research Centre of Finland - Digital Information Systems
P.O. 1000 - VM3, 02044 VTT, Finland - firstname.lastname@vtt.fi*

⁽²⁾ *University of Helsinki - Faculty of Agriculture and Forestry, Department of Forest
Resource Management, 00014 Helsinki, Finland - ilkka.korpela@helsinki.fi*

⁽³⁾ *MosaicMill Oy
Teknobulevardi 3-5, 01530 Vantaa, Finland - ismo.hippi@mosaicmill.com*

⁽⁴⁾ *Simosol Oy
Asema-aukio 2, 11130 Riihimäki, Finland - jussi.rasinmaki@simosol.fi*

The overall objective of the Social Forest Planning project is to develop and demonstrate a novel system for forest management planning and updating of present plans. The system to be developed combines images from cellular phones with remote sensing data to predict forest variables. The variables are input to a Planner Engine that outputs forest resources information for every forest stand and feeds them into a Geographical Information System (GIS). The GPS based location information in the images makes it possible to introduce them easily as in-situ reference data.

The main technical development goal of Social Forest is to develop automatic and interactive methods for the cell phone image analysis. The detailed objectives are:

- Method development for automatic tree stem detection from the cell phone images. This enables automatic computation of tree stem basal area [m²/ha], the key variable in the estimation of the growing stock volume.
- Method development for the interactive retrieval of key variables of forest inventory. The interactive module utilizes results of the automatic analysis as much as possible.
- Method development for the transmission and archiving of the cell phone images through the internet. This is based on an existing pilot solution at VTT.
- Methods for the processing and analysis of Unmanned Aerial Vehicle (UAV) images.
- Use of the cell phone-based data as reference to UAV and satellite image analysis to predict the forest variable values wall-to-wall.
- Develop a system that introduces the stand-wise predictions of forest variables and the cell phone plot data into the Planner Engine that outputs the forest management plan.

The study area is located in the surroundings of Hyytiälä Forest Station (Finland, 61°50'42"N, 24°17'11"E), where tree-wise information and geo-coordinates of about 20 ha of forest are available. Experts from University of Helsinki have selected 54 views over 23 sample plots, covering a wide range of site types, basal area, tree species proportions (mixed and pure plots) and stem dimensions, as well as understory vegetation. Acquisition conditions were such that ground slopes and illumination conditions were also varying. 316 cell phone images have been acquired on 28-29th of June 2010, simulating operative conditions - "point-and-shoot" without prior knowledge.

In addition, a GeoEye image (Panchromatic at 0.41m resolution + Multispectral at 1.65m) has been acquired on 7.7.2010 over Hyytiälä, and an image mosaic from UAV images has been produced by MosaicMill. Cell phone image processing is ongoing.