# SUMMARY

Report of project “From remote sensing technology data for forest inventory information adaptation and operation of forestry spatial to LVM planning support”.

The research project in 2016 had the following main tasks:

1. To adapt already existing remote sensing data of forest taxation and processing methods (scripts, algorithms) for LVM acceptable format.
2. To test obtained algorithms on another company data with a different point densities (up to 4 points / m2, 4.1 - 9 points / m2).

For accomplishment of both tasks combined forest inventory method (hereinafter CFI) which is developed at Latvia University of Agriculture Forest Faculty, was used. CFI method combines the latest technology in data processing by using remote sensing data (LiDAR, NIR) and the inventory work in the forest.

Within the first task data, scripts and algorithms used in CFI method were adapted for LVM needs. To do this, at the start of the project software requirement specification (hereinafter SRS), which specifies requirements for the remote sensing data processing program server, input and output data structure and functional requirements, was developed. According to the SRS, data processing program prototype was developed which carries out all necessary calculation steps.

At the end of the first task testing of algorithms with the LiDAR data with smaller number of points was done. As the result data-processing scripts, processing algorithms and thresholds were obtained. From processing of LiDAR data also heights of sample trees were obtained. Comparison of the average tree height was made in 150 sample plots which were established in year 2014 near Jelgava. Estimation of the test results in accordance with the regulations of the Cabinet of Ministers showed that average tree height of 127 sample plots fitted in the 10% error margin, which represents 85% of the total amount of the sample plots, but 95% of the sample plots average tree height fitted in the 15% error margin.

During the second task CFI methods operation was tested by using the Forest Faculty’s sample plot data base information and two remote sensing data sets - LiDAR and orthophoto data collected by "Metrum" Ltd., as well as the Latvian Geospatial Information Agency orthophoto and LiDAR data. With the CFI method photo with 0.4 and 0.25 m pixel size were processed and obtained results compared with the information collected in forest sample plots. In the forecasting of growing stock the best results showed pine stocks forecast (R2 = 0.924), but the worst stock forecast was for gray alder (R2 = 0,657). The coefficient of determination R2 for total growing stock prediction model was 0.72. In tests of average stem diameter detection models highest results were reached for pine diameter forecast with R2 = 0.96 and birch with R2 = 0.87.

Small size sample plots and the error of their position detection leaves significant impact on the results of the algorithm calibration as for precise algorithm calibration position error should not exceed 1 meter. Therefore during the next phase of the research it is recommended to increase the sample plot size, reduce error of their coordinate detection and for calibration of algorithms use also harvester production file data. During the next phase of the study repeated control of CFI method results in another area should be performed by using varied remote sensing data sources.