Latvia University of Life Sciences and Technologies

APPLICATION OF REMOTE SENSING TECHNOLOGIES IN ORCHARDS MONITORING

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Introduction:

Project goal:

To develop a technological solution for the evaluation of orchards corresponding to the Latvian environmental conditions by applying remote sensing technologies.

Using remote sensing technology, data on tree growth dynamics can be obtained and a multilayer map developed. Analyzing the data would identify sectors with lower increments. By seeing specific sectors on a map, they will be surveyed by gardeners to look for factors that influenced tree growth (nutrient content in the soil, moisture regime, abundant fruit yield, etc.).

An additional goal of the project is to obtain data on tree canopy thickness and total canopy volume. These data will be used to evaluate the efficiency of tree-making work, to adjust the dose calculations of plant protection products.

Discussion:

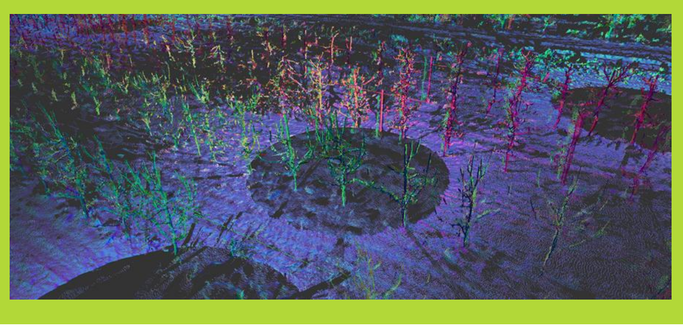
In Latvia, many fruit-growing companies have developed around the turn of the century and now have established a stable production base. Although good yields are achieved on many farms, the average yield level in orchards is insufficient. Often the yields vary from garden to garden in different places. One of the reasons is the heterogeneity of soil and terrain within one field.

Increasing the overall yield is more effective if appropriate measures are taken in targeted garden sectors where yields are lower than average. In the orchard, it is difficult to identify these sectors objectively - this can be done by listing the yield for each tree separately, but it is very labor-intensive and has to be done in a very short time. Vegetative growth of trees is a good indicator of the health status of trees, their growing conditions in general and also shows the potential for productivity. Vegetative height can be assessed visually, but such an assessment is subjective. The visual assessment of the garden is further complicated by the fact that the trees exceed the human height and the trees can only be compared in the direction of the rows.

The objects of the project:

- The first of the objects located in Broceni municipality, Blidene municipality rural territory (56°38’ N (B); 22°43’ E (L)).
- The second object is located in Jelgava municipality, Vilce municipality rural territory (56°26’ N (B); 23°29’ E (L)).
- The third object is located in Tukums municipality, Pure municipality rural territory (57°2’ N (B); 22°52’ E (L)).

Using remote sensing technology, data on tree crown size can be obtained. Repeated measurements would show an increase in shoots over a while. Evaluating the data within the garden would identify sectors with lower increments. By seeing specific sectors on a map, they will be surveyed by gardeners to look for factors that influenced tree growth (nutrient content in the soil, moisture regime, abundant fruit yield, etc.). New technology will be created, as remote sensing with laser scanning has not been used so far in horticulture or for the evaluation of crop plants. Laser scanning as technology is sufficiently available, but the processing and interpretation of the obtained data for the evaluation of orchards is a new application in Latvia and neighboring countries. The project must develop laser scanning parameters (flight altitude, point density during scanning, route density). New knowledge is needed.



Results to be achieved:

- The project will ensure knowledge transfer because during the research there will be active cooperation with researchers from LLU both by conducting remote sensing observations in gardens and by jointly presenting the results in field days and seminars.
- The project creates a collaboration between scientists of the Geospatial Research Laboratory and farmers-gardeners, where so far, such cooperation has not existed.
- Georeferencing criteria in line with the garden assessment will be developed to ensure the accuracy and high reliability of data analysis over several years. As a result of the project, an interactive platform with multi-layer maps will be created.
- The technology included in the study is an innovation not only in the participating farms but also in the horticulture and crop production sector in Latvia as a whole. By successfully implementing this research, farm owners will have a positive experience in testing new technologies and they will continue to be more open to testing new technologies.

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