Real Time Canopy Mapping of an Apple Orchard with New Applied Sensors

III/6

JÁNOS TAMÁS – PÉTER RICZU – PÉTER ÁKOS MESTERHÁZI –
ATTILA NAGY – JÓZSEF NYÉKI – ZOLTÁN SZABÓ

Summary

One of the most difficult challenges in everyday practice is to describe the canopy growing of fruit trees. The accuracy of data determines the available yield quantity and quality. The photosynthetic activity is one of the most important properties concerning the primer production of plants, since there is a very close relationship between water use and the dynamic of tree development and the photosynthetic activity. Our experiment worked out in an intensive apple orchard. The produced high accuracy data can be directly used in the precision horticulture. It could serve as a guide data for the implementation a future “virtual horticulture”. Higher spatial and temporal resolution can help for a better recognition of water balance of orchards. Therefore, the results can provide water and energy saving technologies to reduce the ecological footprint of fruit production.

On 3rd September we carried out a terrestrial 3D laser scanning measurement with Leica ScanStation C10 in Study and Regional Research Farm of the University of Debrecen near Pallag to determine the 3D structure of apple trees. The scanner sweeps along the examined object with a green laser light. The laser beam deflection is occurred by an automatic fast spins polygon mirror system, which provides creating a point cloud composed of millions of points. In the course of the measurement, the scan resolution was 8 mm on 10 m. The processing of raw point cloud was carried out by Leica Cyclone 7.1 and 3DReshaper software (*Figure 1*).

For further investigation of the fruit trees we used another active remote sensing instrument in data acquisition. On the 8th of November 2011 we carried out the measurement with GreenSeeker 505 vegetation indexmeter. The weed coverage of the soil surface and the spectral characteristic of the canopy were investigated by the instrument (*Figure 2)*. The most information was provided by the NDVI value, which calculated the instrument. As an interface of GreenSeeker 505 is working AgGPS FmX integrated display by Trimble, which collected all of the data.

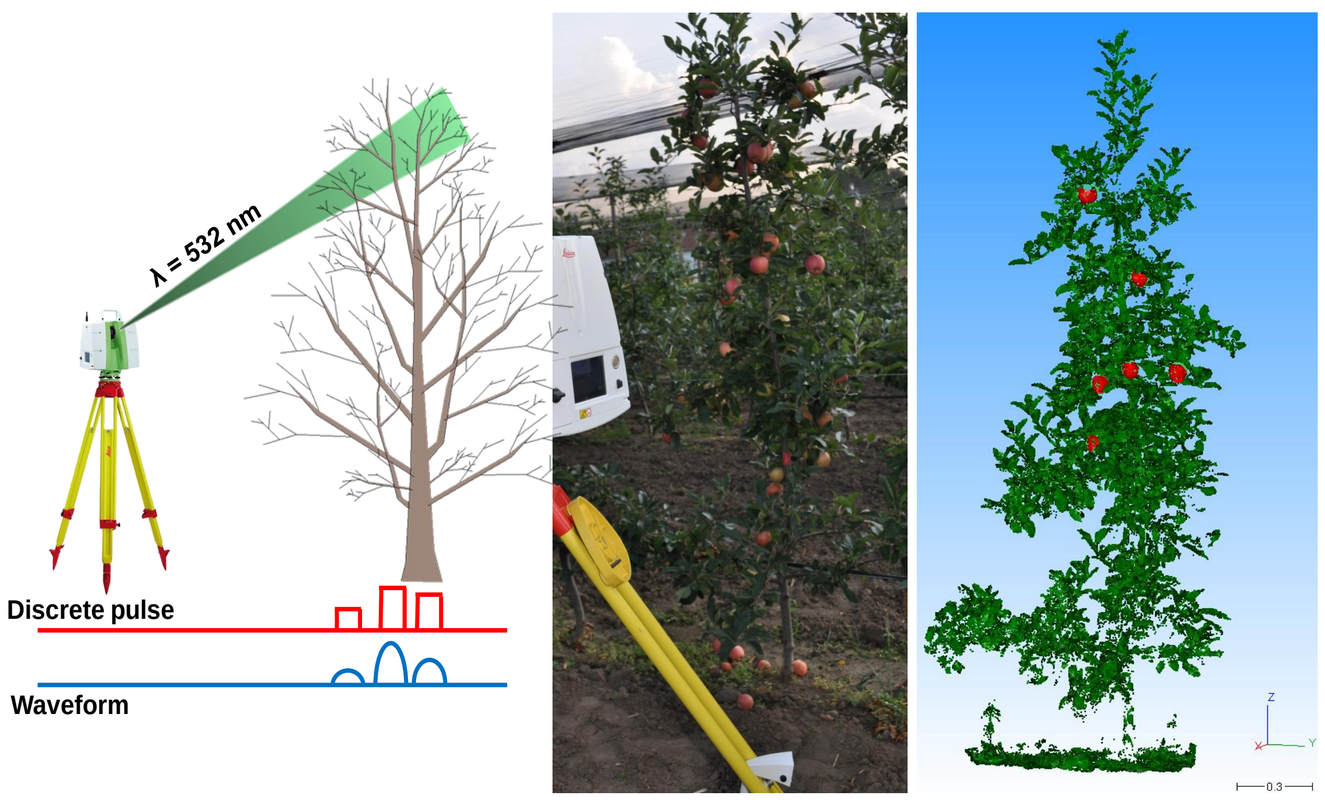
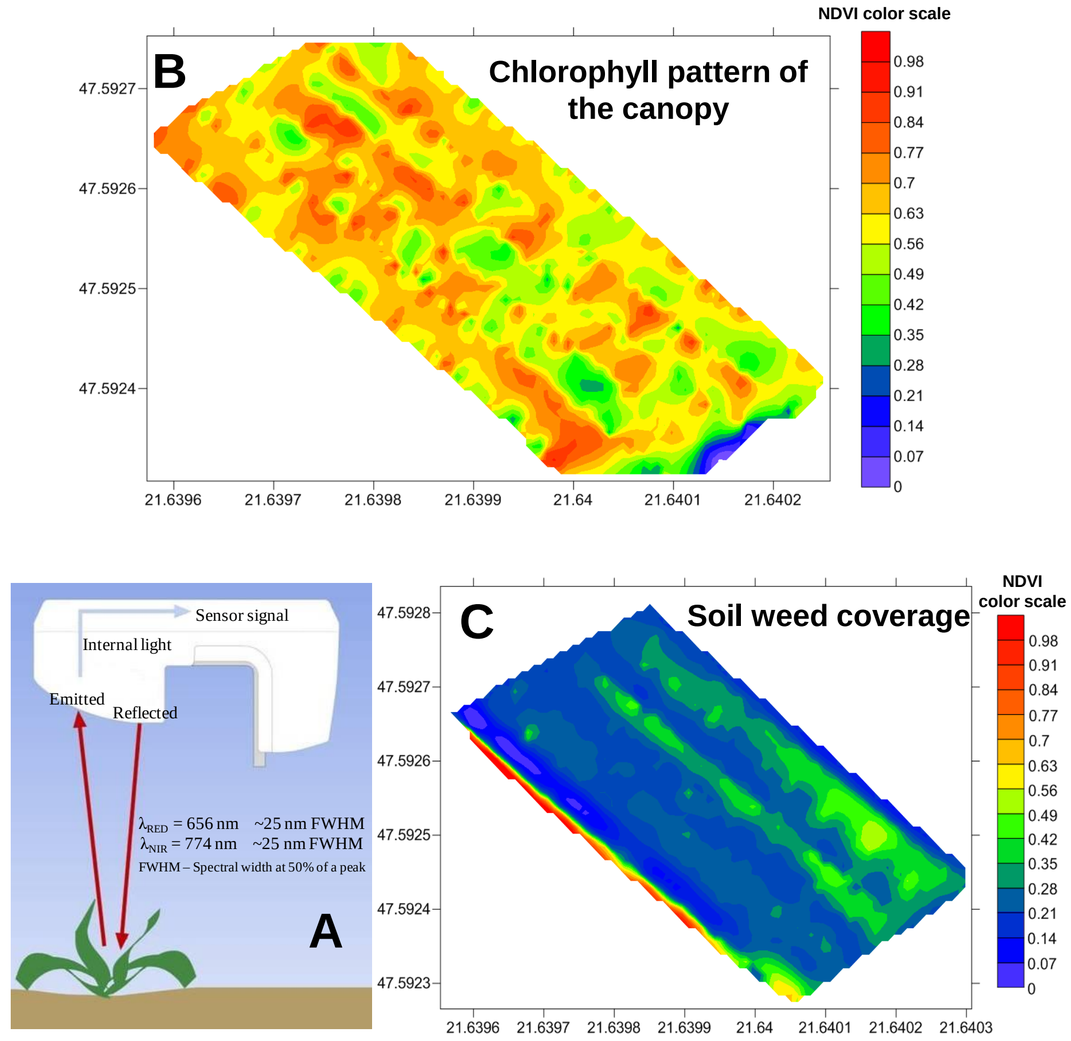


Figure 1. The principle of laser scanning wit echoes and the model of a chosen tree in 3DReshaper software environment



Conclusions

The results shown, the used instruments were appropriate in horticulture applications. The NDVI value could support a precision pest management system to weed control. Further experiments are needed to recognize the canopy structure based on the combination of both high-tech instruments.

Figure 2. Working principle of GreenSeeker 505 *(A)*, *NDVI canopy map (B) and NDVI soil map (C) of the investigated apple orchard*

Acknowledgements: The laser scanning was provided by the University of West-Hungary, Faculty of Geoinformatics. The authors thank Attila Váradi from Leica Geosystems Hungary Ltd. for his assistance in Leica software processing. The author would also like to thank the 3DReshaper software license to point cloud works. This study is funded by TECH_08-A3/2-2008-0373 and TECH_08-A4/2-2008-0138 projects.

TÁMOP 4.2.1/B-09/1/KONV-2010-0006

National Development Agency
www.ujszechenyiterv.gov.hu
06 40 638 638

HUNGARY'S RENEWAL

The projects are supported by the European Union and co-financed by the European Social Fund.