TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Umweltwissenschaften, Fachrichtung Forstwissenschaften

Institut für Bodenkunde und Standortslehre, Professur für Standortslehre und Pflanzenernährung

Technische Universität Dresden, 01062 Dresden

Topic for Bachelor Thesis

"Determination of water conducting area in a SRC Poplar plantation (*Populus* sp.) and considerations for estimation of stand transpiration"

Short-rotation coppice (SRC) for production of biomass for energy are widely cultivated in temperate zones and could represent the most cost-efficient way to comply with the targets set by the EU Renewable Energy Directive which aims to achieve a share of 20% in energy from renewable sources (Navarro *et al*., 2018; Schmidt-Walter, P. 2012). Under that framework, the EU Project "D4EU – Securing Sustainable Dendromass Production with Poplar Plantations in European Rural Areas (BBI JU Grant 745874)" aims at establishing sustainable, Short-Rotation Coppice (SRC)-based regional cropping systems for agricultural dendromass on marginal land that feed into bio-based value chains and create additional job opportunities in rural areas. For that purpose, 2,500 ha of short rotation poplar plantations are established. Our task comprises the assessment of the poplar plantations in particular relating water consumption to tree yield. Specifically, there are a number of different methods to measure tree water use. One of them is the Heat Ratio Method (HRM) which quantifies xylem-sapflow along the water conducting sapwood of an individual tree (Burgess et al., 2001). To apply this method there are several prior analyses to be performed in order to minimise uncertainties during the subsequent upscaling process and estimation of stand transpiration (Forster 2017).

Figure 1 Sapflowmeter - Heat Ratio Method installed in Poplar plantation (Photo: Filipa Tavares)

Tasks

- Biometric and statistical analysis of growth and yield data of *Populus* sp. plantations
- Determination of water-conducting sapwood depth in stems of selected trees using different methods
- Determination of cross-sectional sapwood area
- Recommendations/Considerations for upscaling sapflow measurements from tree to stand level
- Thesis should be written in English language

Supervisor: Prof. Dr. Karl-Heinz Feger

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Recommended papers:

Burgess S.S.O., Adams, M.A., Turner, N.C., Beverly, C.R., Ong, C.K., Khan, A.A.H., and Bleby, T.M. 2001. An improved heat pulse method to measure low and reverse rates of sap flow in woody plants. Tree Physiol. 21: 589–598. doi:10. 1093/treephys/21.9.589.

Forster, M. 2017. How reliable are Heat Pulse Velocity Methods for Estimating Tree Transpiration? Forests 2017, 8, 350; doi:10.3390/f8090350

Navarro, A., Portillo-Estrada, M., Arriga, N., Vanbeveren, S.P., Ceulemans, R. 2018. Genotypic variation in transpiration of coppiced poplar during the third rotation of a short-rotation bio-energy culture. GCB Bioenergy. 2018;1–16. doi: 10.1111/gcbb.12526

Schmidt-Walter, P., Lammersdorf, N. 2012. Biomass Production with Willow and Poplar Short Rotation Coppices on Sensitive Areas – the impact on Nitrate Leaching and Groundwater Recharge in a Drinking Water Catchment near Hanover, Germany. Bioenerg. Res. (2012) 5:546–562. doi 10.1007/s12155-012-9237-8