Summary

This thesis aims to explore a novel and emerging field known as agrogeophysics, which applies geophysical methods to address challenges in agriculture. The focus of the study also includes forestry, where similar measurement techniques may be employed for related purposes. Agrogeophysics is particularly referenced in the context of modern agricultural practices that emphasize sustainability and active responses to climate change. The theoretical part includes an overview of the most commonly used methods and examples of their practical applications. The research itself is extended by two original experimental studies.

The first experiment investigates an agroforestry system using Electrical Resistivity Tomography (ERT). During a controlled flooding test, it was confirmed that the water infiltrates deeper beneath buffer strips than in the surrounding land. These strips significantly contribute to water retention in the landscape and help mitigate other adverse effects, such as soil erosion. The experiment concludes with the calculation of key parameters for the practical implementation of buffer strips — specifically, the relationship between strip width, spacing, and the amount of precipitation the strip is capable of fully absorbing.

The second experiment examines spatial variations in the electrical and magnetic properties of the subsoil surrounding trees. These parameters can be used to non-destructively estimate the extent of the root system. The hypothesis—that the root zone would exhibit increased magnetic susceptibility—was not confirmed. Instead, the root zone of mature trees exhibits a measurable minimum in magnetic susceptibility, likely due to the prevailing dry and oxidizing conditions. Additionally, it is bordered by a narrow band of magnetic maximum, approximately corresponding to the size of the tree canopy. This maximum is probably related to atmospheric pollution by magnetic microparticles.

Key words: geoelectrics, electromagnetics, ERT, magnetic susceptibility, agrogeophysics, root system, buffer strip