

## **Title: “ Examining the Variation of Root Length Density in Agroforestry Systems as a Function of Distance from Hedge Rows”**

The study aims to understand how the presence of hedgerows affects the spatial distribution of roots in agroforestry systems and how it affects overall root length density, as root competition between trees and crops for resources is crucial for assessing the performance of crops grown near trees and the extent of the root zone shared by trees and crops. Systematic measurements and analyses will be used to investigate the differences in root development depending on the proximity to the hedgerows.

### **Objectives:**

1. Quantify and compare root length density in agroforestry systems at various distances from the hedgerows.
2. Investigate the impact of hedge rows on both vertical and horizontal variations in root length density.
3. Evaluate potential correlations between root length density and the performance of above-ground plants.
4. Develop recommendations for optimizing agroforestry system design based on observed patterns of root length density.

### **Methodology:**

1. Deploy destructive root sampling methods, such as soil coring, to measure root length density at different distances from the hedgerow rows within agroforestry plots.
2. Conduct virtual simulations of root growth and sampling based on a dynamic RSA model (e.g., CPlantBox).
3. Analyze the vertical and horizontal distribution of roots in relation to hedgerow rows.
4. Collect data on above-ground plant performance, including growth and yield parameters, to correlate with below-ground root length density.
5. Perform statistical analyses to identify significant patterns and relationships in the data.

### **Expected Outcomes:**

1. Insights into the spatial variation of root length density in agroforestry systems based on the distance from hedgerow rows.
2. Understanding the influence of tree characteristics and hedgerow configurations on belowground root distribution.
3. Exploring the correlation between root length density patterns and aboveground plant performance.
4. Providing recommendations for optimizing agroforestry system design based on observations of root length density.