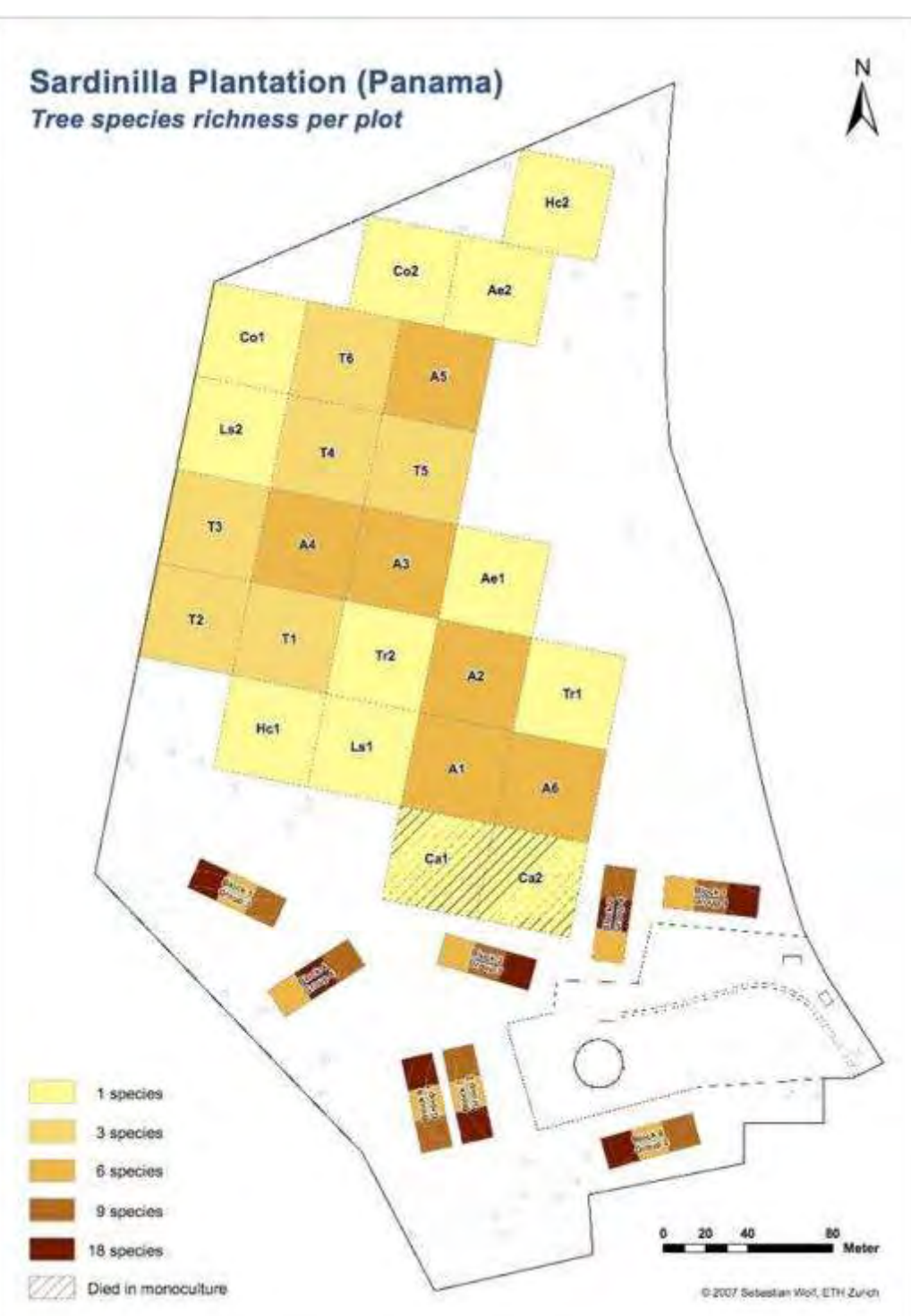


How Neighbourhood Interactions Between 6 Tropical Tree Species Affect the Root System's Horizontal Extent

A Master's Thesis by Christopher Madsen with Supervision of Dr. Catherine Potvin

Site Design¹

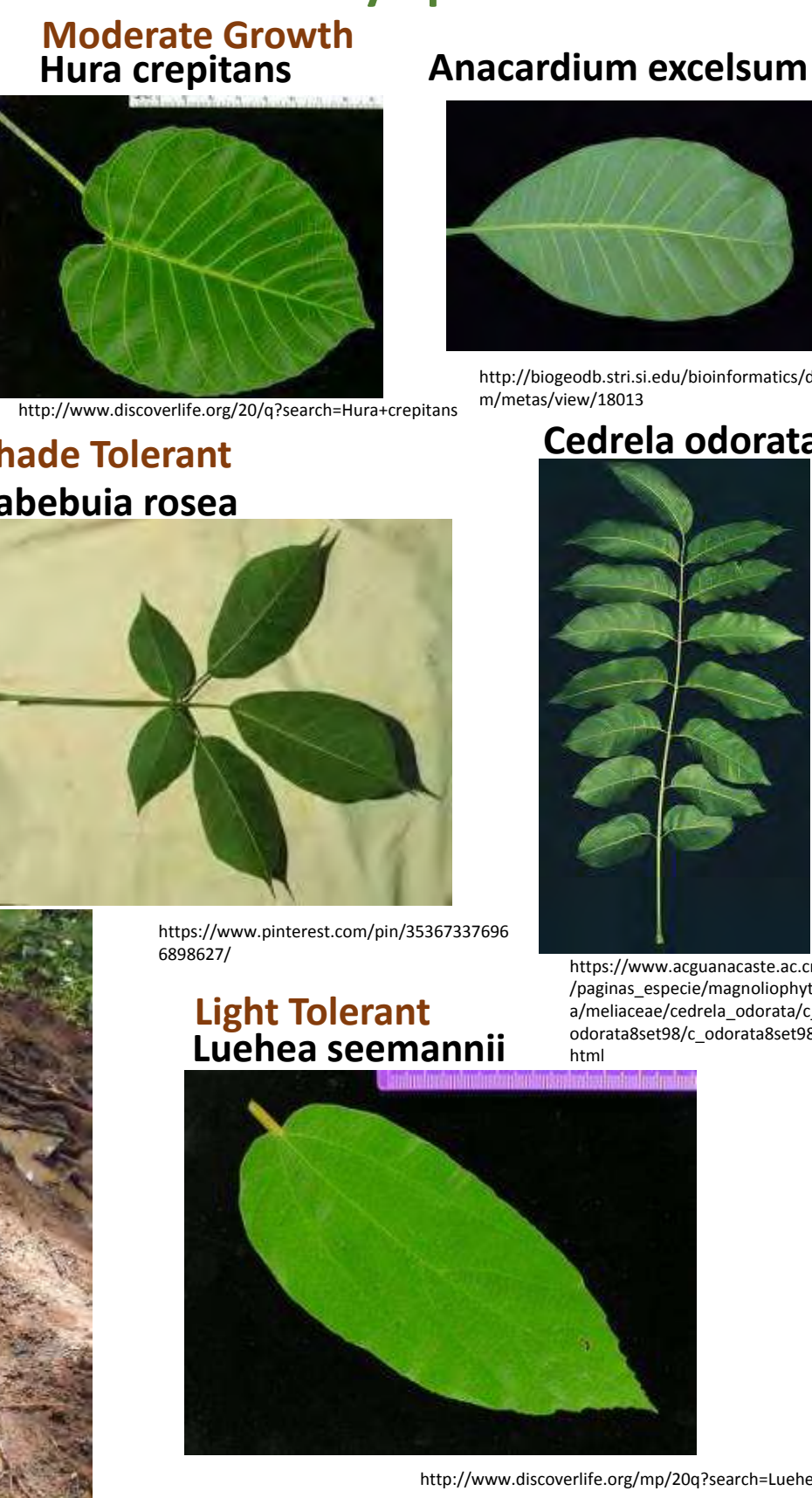


<http://www.treedivnet.ugent.be/ExpSardinilla.html>

Methods 1 - Harvest



Study Species



Objectives

- Predict Mean and Total Root Systems
 - Length:Radius
 - Mean
 - Total
- Delineate Canopy Extent
- Compare spatial extent of root systems and canopy for:
 - Species
 - Neighbourhoods
 - Plots
 - Diversity Treatments

ANOVA of Mean Root Length

	DF	Sum Sq	Mean Sq	F value/AET	Pr (>F) at $\alpha = 0.05$
Species	4	824	206.05	4.9188	Not sig.
Treatment	3	379	126.28	3.0146	Not sig.
Species:Treatment	12	1071	89.26	29.76	<2e-16
Appropriate Error Term (AET)	66	2764	41.89	1	<2e-16
Residuals	1164	3491	3.00		

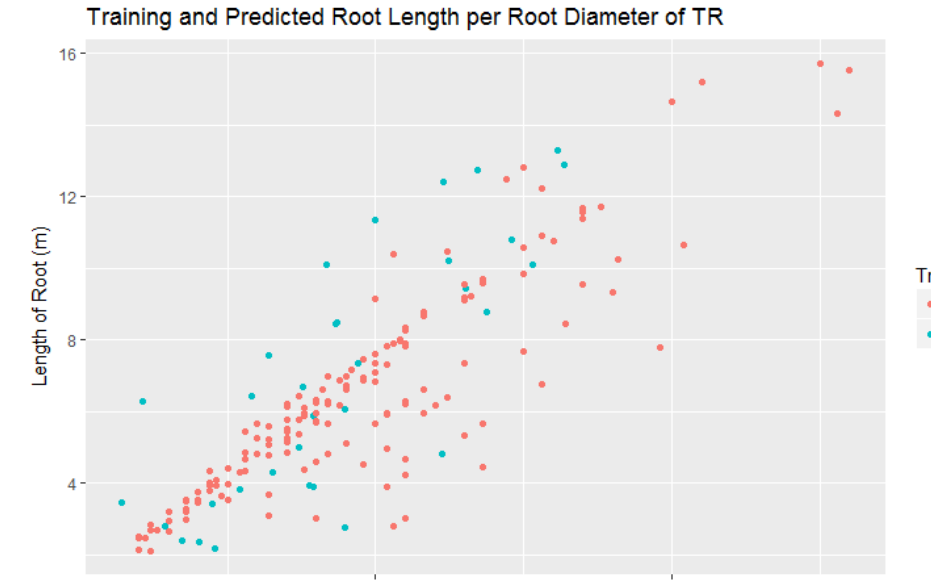
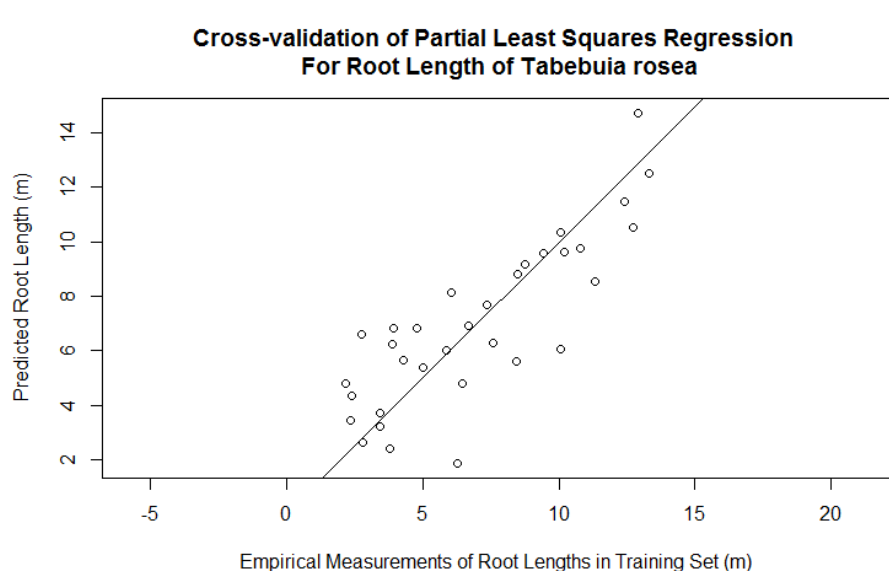
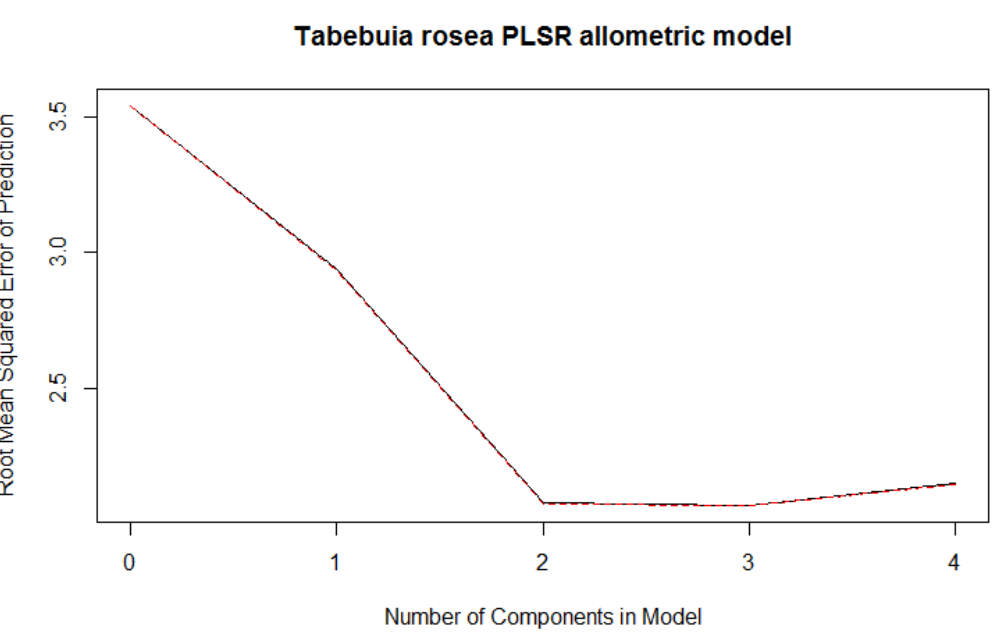
Methods 2 - Allometry

e.g. *Tabebuia rosea*

Partial Least Squares Regression²

$$y_{nj} = \sum_{i=0}^k \beta_i x_{ni} + \epsilon_{nj}$$

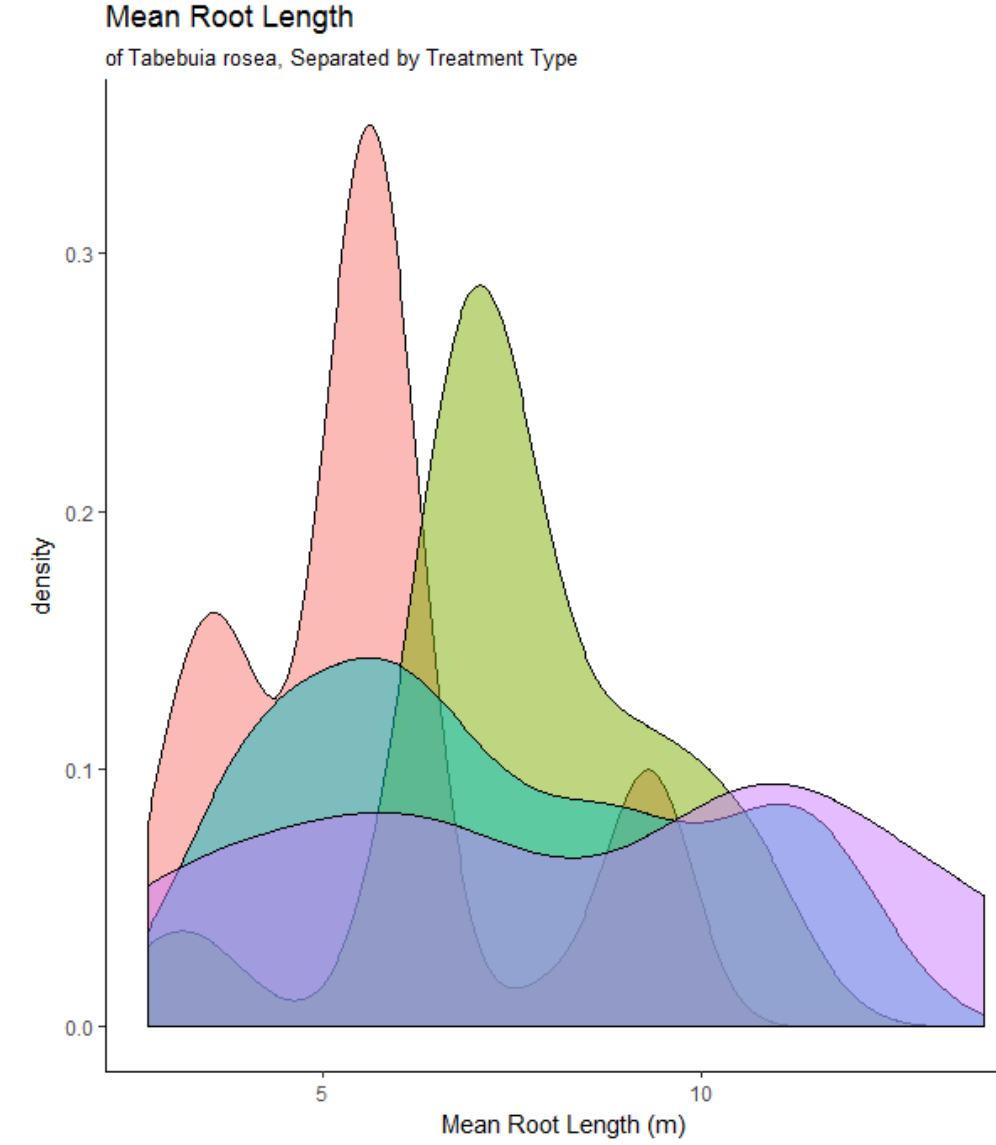
Use RMSEP to choose best model



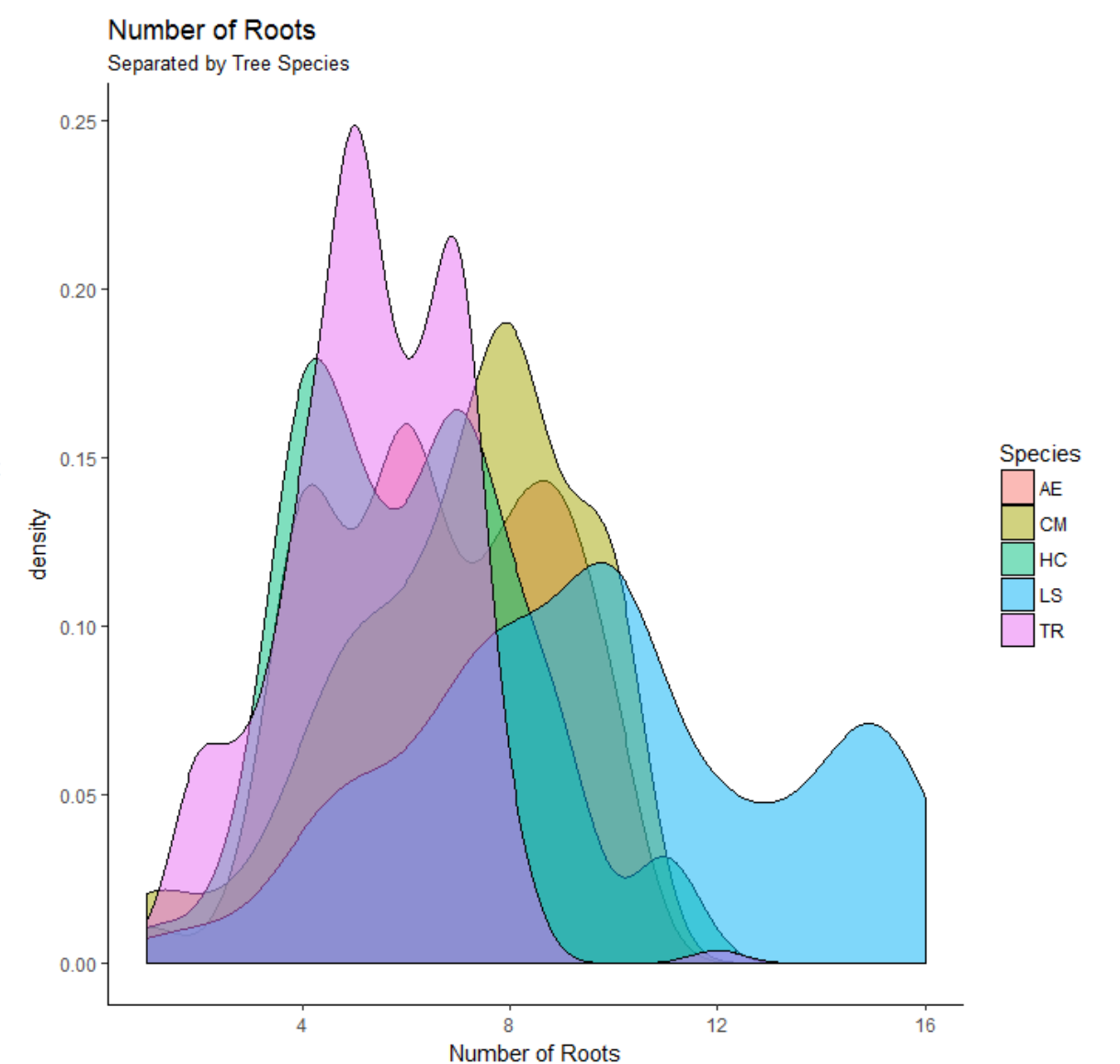
Allometric equation $Y = aX_1 + bX_2 + cX_3$

Results

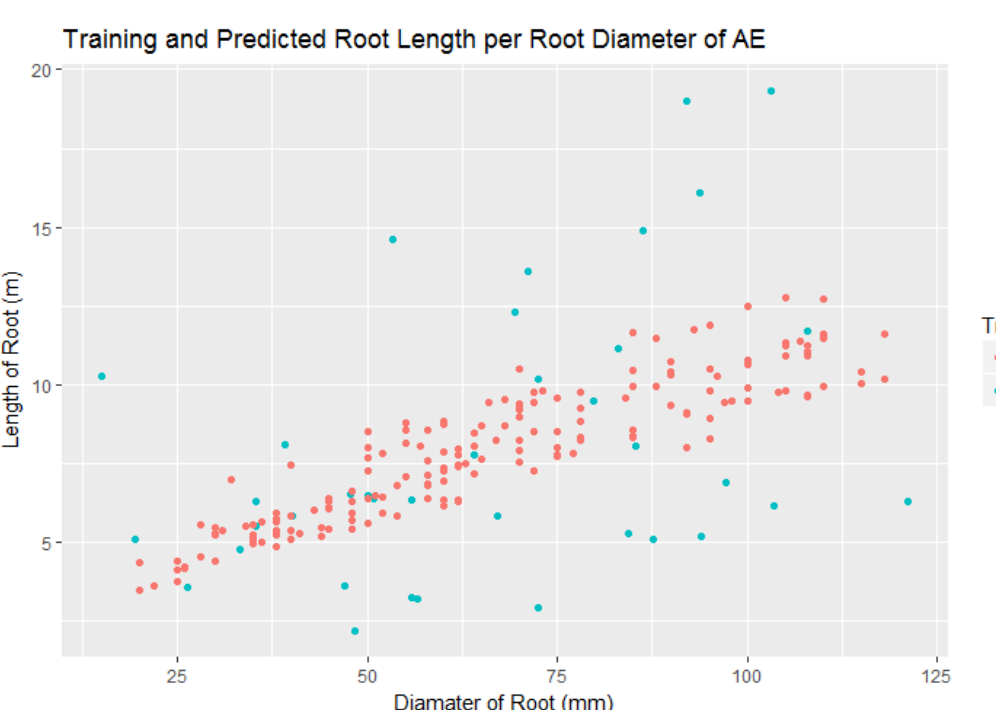
Mean Root Length



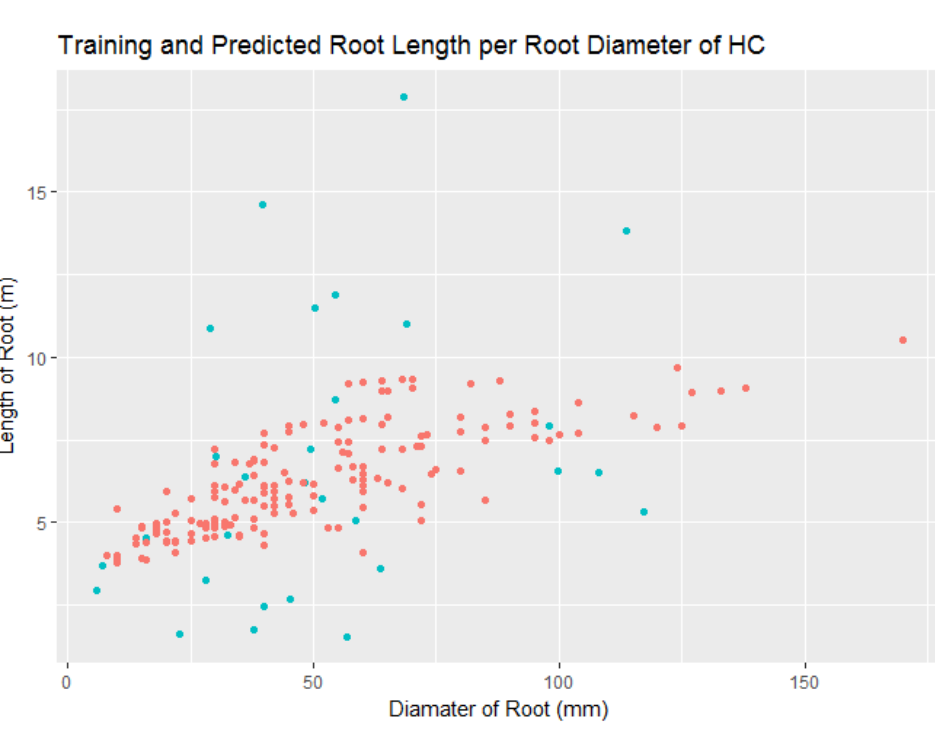
Number of Roots



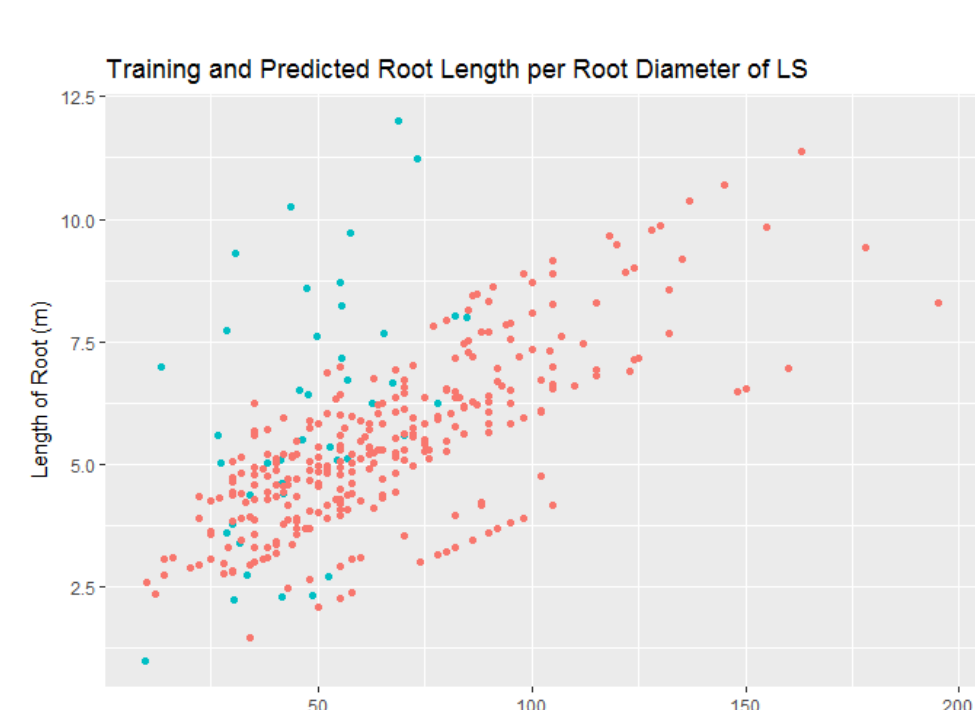
Anacardium excelsum



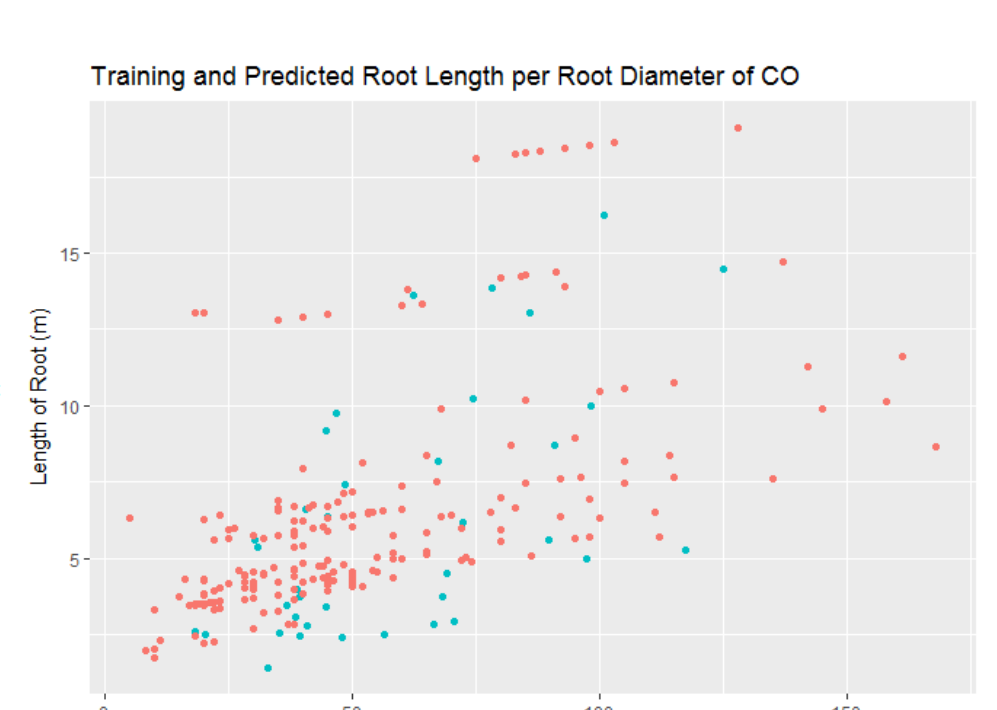
Hura crepitans



Luehea seemannii



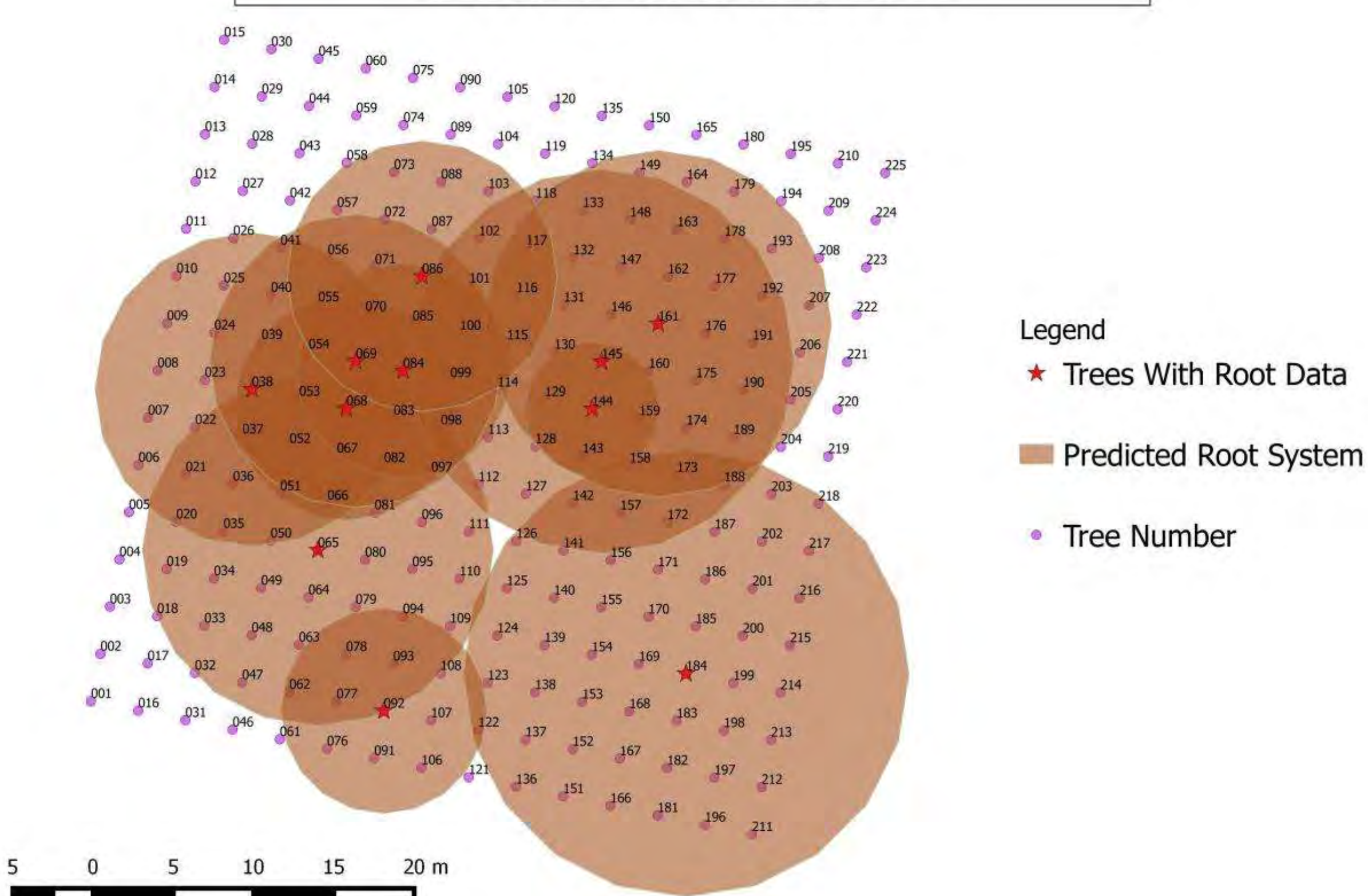
Cedrela odorata



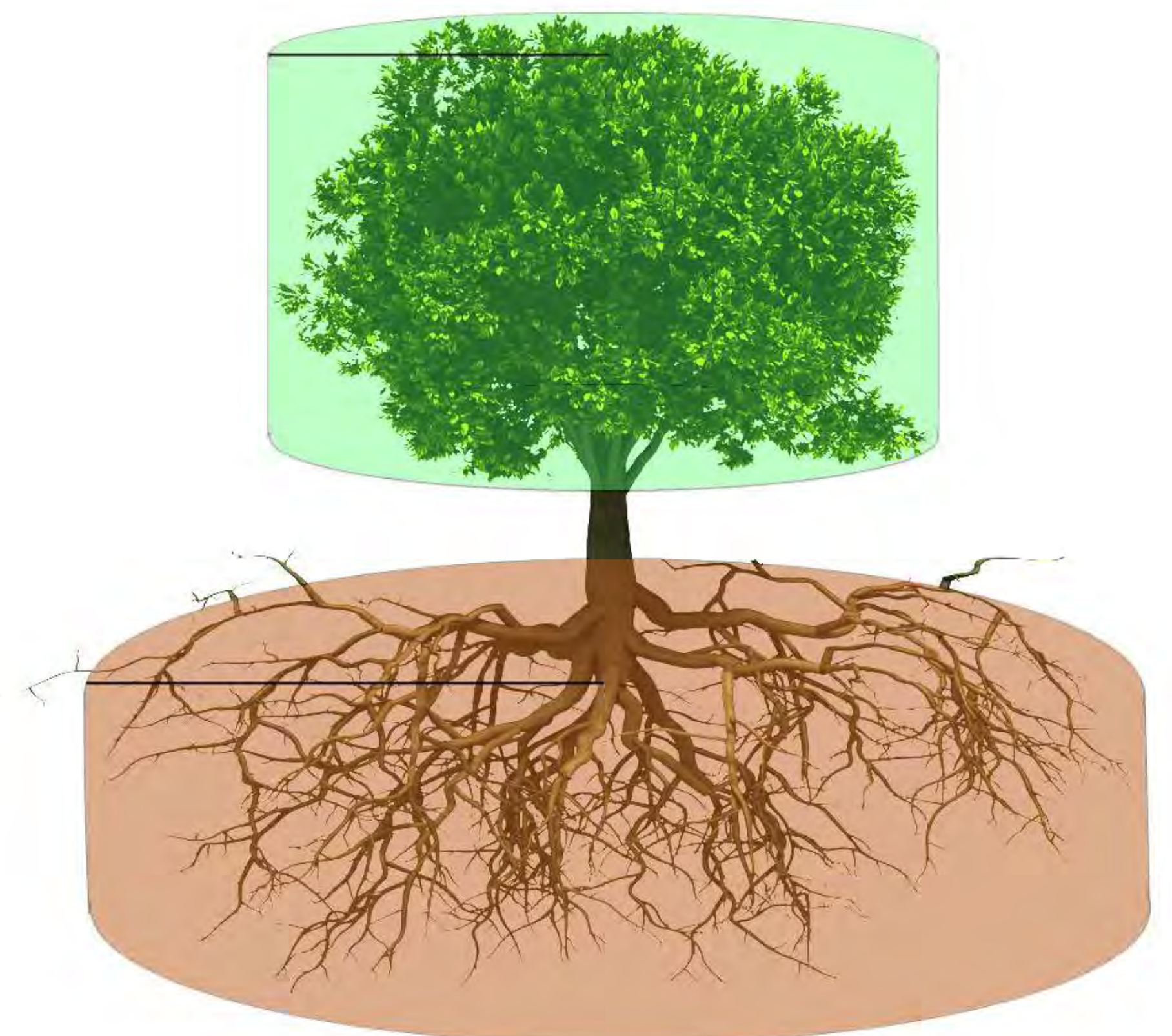
Future Steps

1. Potential Root Overlap - Competition Neighbourhoods

Plot A6: Six Tree Species



2. LiDAR Canopy Data - Compare Canopy and Root Extents



Adapted from: <https://www.dreamstime.com/stock-photography-tree-root-image17120212>

References

- Potvin, C., & Gotelli, N. J. (2008). Biodiversity enhances individual performance but does not affect survivorship in tropical trees. *Ecology Letters*, 11(3), 217-223. <https://doi.org/10.1111/j.1461-0248.2007.01148.x>
- Sileshi, G. W. (2014). A critical review of forest biomass estimation models, common mistakes and corrective measures. *Forest Ecology and Management*, 329, 237-254. <https://doi.org/10.1016/j.foreco.2014.06.026>

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