

Assessing aboveground carbon sequestration potential of trees in agroforestry systems in Southern Africa using 3D data

Bohn Reckziegel Rafael¹, Kunneke Anton², Morhart Christopher¹, Sheppard Jonathan P.¹, Kahle Hans-Peter¹

¹ Chair of Forest Growth, University of Freiburg, Freiburg, Germany

² Department of Forest and Wood Science, Stellenbosch University, South Africa

Abstract (max 250.words)

Due to its location and socio-economic context, Southern Africa is especially vulnerable to the impacts of climate change and is expected to face severe economic, social and environmental challenges in the approaching decades. Agroforestry systems (AFS) are expected to be part of the solution as innovative, sustainable and flexible land use systems capable of adapting to a changing climate, positively influencing agricultural production and food security, facilitate carbon capture and storage while moderating negative climatic influences on rural livelihoods. An important attribute of promoting AFS in African landscapes is the carbon sequestration potential of the tree component. We describe an approach using Terrestrial Laser Scanning (TLS) to estimate the aboveground carbon sequestration potential of tree species growing in African AFS. This innovative non-destructive methodology uses 3D point cloud data derived from single trees collected with a TLS device, which has been proven to be an effective and precise procedure for the assessment of biomass. For that purpose the tree volume data are used as basis for calculating the biomass together with species specific wood densities. Validation is undertaken utilising a destructive approach, sample trees are felled and accurately weighed to generate precise ground truth data. The TLS derived biomass models for single trees will be used to model the aboveground carbon sequestration potential of different AFS management scenarios in the Southern Africa region.