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"Resilience of agricultural systems against crises"

Optimising the Measurement of Landscape Biomass Carbon in Agricultural Landscape Mosaics

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Abstract

Development of quick, reliable and economical methods of predicting the amount of biomass carbon stored in the landscape is essential if smallholder farmers are to benefit from carbon markets by growing trees on their farms. While estimation of landscape carbon can be easily achieved through use of allometric models, the quality of the model depends on the empirical data used. As part of the effort in developing standard methods of estimating biomass carbon in agricultural landscapes, a study was conducted in Western Kenya in three sentinel blocks (Lower, Middle and Upper Yala) along the River Yala basin. The study used established trees with the aim to determine (i) sources of error that can be easily avoided, (ii) ways of achieving quality empirical data, and (iii) constraints accompanying biomass estimation. Seventy two trees ranging in diameter at breast height from 3–102 cm (total basal area: 10.2 m^2) were randomly selected for destructive sampling and their dendrometricmeasurements taken. The roots system, stem, branches and leaves contribute 22 %, 45 % 30 % and 3 % of the total tree biomass respectively. Belowground biomass sampled to a depth of 2 m within 2 m radius from the tree edge allowed only 77.6 % of the total root biomass to be captured. About 1.1 % of the total aboveground biomass was lost though sectioning the stem and branches into practically weighable pieces (<300 kg); with losses as high as 2 % recorded on large trees. Prediction error of equations did not increase substantially above a sample size of 30 trees. It is therefore recommended that methods for quantifying biomass in agricultural landscapes should always take into account the biomass of all components, ensure sufficient sampling depth and width, and that the sampling strategy covers the heterogeneity of the tree diversity in the landscape.

Keywords: Agricultural ecosystems, allometric equations, biomass, carbon, western Kenya

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