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Litter Fall Production in West-African Forests and Plantations

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Abstract

Tree litter fall is the major above-ground input of carbon (and nutrients) into the forest and plantation floor. Such litter layer protects the underlying humus and mineral soil against drought and represents a considerable buffer improving the ecosystem capacity. However, on regional scale, litter fall data are scarcely available on sufficient stands, which is to be collected and analyzed, when estimating carbon budgets and accounting green house gas needed to address international agreements. In many local studies, the annual litter fall flux has been found to correlate with site, stand, climate characteristics. This opens the possibility of making models to predict tree litter fall on regional scale both in forests and plantations where it is not measured directly.

To develop such models, litter fall was collected and analysed in locally representative secondary forests and different tree plantations (mango, orange, oil palm, cashew, teak) in Benin, West Africa, with a monthly interval and from North to South Benin (10°N₂°E to 6°N₂°E) covering the unimodal and bimodal Guinean Coast climate regime. Then data from a number of West African projects, in which litter fall and other stand parameters had been determined, were compiled. This combined data set was used to identify the most significant litter fall factors among readily available variables of site (longitude, latitude, elevation, soil type, carbon, nitrogen, phosphor, potassium, cation exchange capacity and PH value...), stand (diameter at breast height, basal area, tree height, number of stems, crown diameter, specific leaf area index, eco-volume...) and climate (annual and monthly precipitation amount, number of rainy days, temperature...). Accordingly, prediction models of litter fall were developed.

Keywords: Benin, carbon budget, forest, litter fall production, modelling, plantation, West Africa