

## **Nutrient Cycling in Primary, Secondary Forests and Cocoa Plantation in the Ashanti Region, Ghana**

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### **Abstract**

Primary forest (reserved area), secondary forest and cocoa plantation land uses characterize uplands of Dwinyama watershed in Ghana within the dry semi-deciduous forest zone. The nutrients recycled in the land uses were studied through leaf litter fall, nutrient release, nutrient fluxes estimation and topsoil nutrient contents leading to the identification of appropriate land use in upland regions that may potentially influence lowland farming. Mean annual leaf litter produced by the primary and secondary forests was both 7.9 t ha<sup>-1</sup> and that for cocoa plantation was 6.9 t ha<sup>-1</sup>. The primary forest leaf litter showed rapid decomposition than the secondary forest and the cocoa leaf litter. Nutrients released from the decomposing leaf litters were fast for N, P, K, Ca and Mg for the primary and secondary forests. Less leaf litter production and high rainfall regimes in South America and southeast Asia probably contributed to the lower annual nutrient fluxes recorded than that of the dry semi-deciduous tropical forest in Ghana. The soil under cocoa plantation was higher in Ca than in the secondary and primary forests soils. The primary forest recorded higher contents of top soil N, P, K, and Mg nutrients due to non-frequent removal of the vegetation, presence of organic matter that increases soil carbon content and cation exchange capacity. Generally, trends of nutrients released and the quantities of nutrient fluxes estimate in the land uses in Ghana suggested that nutrient cycling was better in the primary forest followed by the secondary forest and cocoa plantation. The trend in the land uses was primary > secondary > cocoa, suggesting that forests in uplands will protect watersheds, and, through leaching and erosion, nutrients may be transported to the lowlands for continuous and sustainable cropping with little or no inorganic fertilizer application.