



Litterfall dynamics and nutrient deposition at different elevation and land use levels on Mt. Kilimanjaro, Tanzania

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One of the major pathways that connect above- and belowground nutrient and carbon stocks in forest ecosystems is litterfall. Depending on climate, tree species composition and stand structure it varies considerably between different ecosystems. Another driving factor that is known to affect ecosystem cycles is the level of anthropogenic disturbance such as land use. In case of tropical regions this is often present as the transformation from rainforests to plantation economy and sustainable agroforestry.

The objective of this study was to quantify and determine patterns of carbon and nutrient deposition via tree litterfall in natural and anthropogenically affected forest ecosystems along an elevation gradient of Mt. Kilimanjaro. Tree litter of three natural (lower montane forest), two sustainably used (home gardens) and one intensively managed (shaded coffee plantation) ecosystem was collected on a biweekly basis from May 2012 to July 2013. Samples were separated into leaves, branches and remaining residues, dried and weighted. Carbon and nutrient content were measured in leaf samples.

We found that the overall annual pattern of litterfall was closely related to rainfall exhibiting a large peak during the dry season. Albeit visible on all plots, this characteristic decreased with elevation. No consistent patterns were found for other components than leaves. Total annual litter mainly consisted of leaf litter and ranges from 4639 kg/ha to 10673 kg/ha for all vegetation types. Flowers, fruits, etc. make up roughly 20% of total litter. Highest and lowest values occurred at home gardens and could not be significantly related to land use or elevation levels. Chemistry though differed between natural and used forest plots. N, P and K contents increased significantly with usage intensity while Mn decreased and C is more or less unaffected.

We conclude that on the southern slope of Mt. Kilimanjaro, short term variations in litterfall are related to seasonal climatic conditions whereas the total annual sum is not climatically dependent. Nutrient cycles of Kilimanjaro forest ecosystems are significantly altered by land use and the associated changes of dominant tree species.