

## **Site Characteristics and Carbon Dynamics of the Gwangneung Deciduous Natural Forest in Korea**

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### **ABSTRACT**

The study area, Kwangneung Experiment Forest (KEF) is located on the west-central portion of Korean peninsula and belongs to a cool-temperate broadleaved forest zone. At the old-growth deciduous forest near Soribong-peak (533.1m) in KEF, we have established a permanent plot and a flux tower, and the site was registered as a KLTER site and also a KoFlux site.

In this study, we aimed to present basic ecological characteristics and synthetic data of carbon budgets and flows, and some monitoring data which are essential for providing important parameters and validation data for the forest dynamics models or biogeochemical dynamics models to predict or interpolate spatially the changes in forest ecosystem structure and function.

We made a stemmap of trees in 1 ha plot and analyzed forest stand structure and physical and chemical soil characteristics, and estimated carbon budgets by forest components (tree biomass, soils, litter and so on). Dominant tree species were *Quercus serrata* and *Carpinus laxiflora*, and accompanied by *Q. aliena*, *Carpinus cordata*, and so on. As a result of a field survey of the plot, density of the trees larger than 2cm in DBH was 1,473 trees per ha, total biomass 261.2 tons/ha, and basal area 28.0 m<sup>2</sup>/ha.

Parent rock type is granite gneiss. Soil type is brown forest soil (alfisols in USDA system), and the depth is from 38 to 66cm. Soil texture is loam or sandy loam, and its pH was from 4.2 to 5.0 in the surface layer, and from 4.8 to 5.2 in the subsurface layer. Seasonal changes in LAI were measured by hemispherical photography at the 1.2m height, and the maximum was 3.65. And the spatial distributions of volumetric soil moisture contents and LAIs of the plot were measured.

Litterfall was collected in circular littertraps (collecting area : 0.25m<sup>2</sup>) and mass loss rates and nutrient release patterns in decomposing litter were estimated using the litterbag technique employing 30cm30cm nylon bags with 1.5mm mesh size. Total annual litterfall was 5,627 kg/ha/year and leaf litter accounted for 61% of the litterfall. The leaf litter quantity was highest in *Quercus serrata*, followed by *Carpinus laxiflora* and *C. cordata*, etc.

Mass loss from decomposing leaf litter was more rapid in *C. laxiflora* and *C. cordata* than in *Q. serrata* litter. About 77% of *C. laxiflora* and 84% of *C. cordata* litter disappeared, while about 48% in *Q. serrata* litter lost over two years. The carbon pool in living tree biomass including below ground biomass was 136 tons C/ha, and 5.6 tons C/ha is stored in the litter layer, and about 92.0 tons C/ha in the soil to the 30cm in depth. Totally more than about 233.6 tons C/ha was stored in DK site. And then we have drawn a schematic diagram of carbon budgets and flows in each compartment of the KEF site.

*Keywords: LTER, carbon pools, stand dynamics, LAI, soil moisture, litterfall, Quercus serrata, Carpinus laxiflora*