

strip-cutting treatments in northeast China. We used a generalized linear mixed model to quantify the sapling height growth of under-planted Korean pine. The derived growth model predicted a 39–45% reduction in annual height growth for the narrowest strip-cuts (4.5 m) versus the open site (i.e., a site with no canopy), while a 17–33% reduction in annual height growth was predicted for the wider strip-cuts (6.0–7.5 m) versus the open site. To maintain adequate height growth, it is recommended that forest managers create wider strip-cuts (i.e., ≥ 6.0 m) for the purpose of under-planting Korean pine saplings in larch plantations.

Variation throughout the year of N₂-fixation of *Acacia mangium* in pure stand or in association with *Eucalyptus grandis*.

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N₂-fixation by leguminous trees can be an important source of nitrogen in forest plantations, but little is known about its seasonal variations. We estimated N₂-fixation by *Acacia mangium* growing in pure stands (100A) and in association with *Eucalyptus grandis* (50A:50E) in Brazil. At 27 months of age, we applied ammonium sulphate (99.8 atom % ¹⁵N) diluted in water (1.1 kg N/ha) to the litter. Every 3 months during one year we selected four trees per species in each treatment and collected all the leaves from two branches distributed in each third of the canopy. The average percent of N derived from fixation (%Ndfa) was 70.3±5.2% and 48.1±10.8% in 50A:50E and in 100A, respectively. The higher %Ndfa in mixture could be due to lower soil N availability than in 100A and to strong competition of *Eucalyptus* over *Acacia* for soil N uptake. The highest and lowest values of %Ndfa were observed at the end and at the beginning of the rainy season, respectively. N₂-fixation showed lower seasonal variations in 50A:50E than in 100A. In this last treatment, %Ndfa was about 30% higher at the end of the rainy season than during other periods.

Analysis of seedling production in forest nurseries in the Alto Paraná District of Paraguay. Perdomo Rolón, M. (Instituto Forestal Nacional, Paraguay; titaperdomo@hotmail.com).

In order to obtain good results in a forest plantation, it is of utmost importance to use high-quality forest reproductive material. The present study was aimed at analyzing the seedling production in the forest nurseries of the Departamento Alto Paraná by means of personal interviews. It turned out that 91% of the nurseries included in the study produced seedlings exclusively from seeds and 9% performed clonal propagation. The majority of producers preferred seed collection. In certain zones of the district, only 8% acquired certified seeds from the National Forest Institute. The native species with the highest production was *Handroanthus impetiginosus* (Mart. ex DC.) Mattos which was present in 73% of the nurseries considered in the study. Among introduced species, production was highest for *Eucalyptus grandis* Hill ex Maiden which was present in 86% of the nurseries. The study found evidence of a high potential for seedling production and of the need to establish a control mechanism for the production of seedlings with better genetic qualities and safe provenance. In addition, the importance of complementing such a mechanism with a system to support producers was identified in order to improve production.

Tropical dry forests aboveground biomass measurements in West Africa, Abdoulaye Wildlife Reserve (Togo). Pereki, H.

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In West Africa, researchers typically focus on forest diversity assessment and structure without regards to biomass measurements and carbon cycling. To address this issue, we evaluated and quantify tree biomass in Abdoulaye Wildlife Reserve in Togo. Tree height, diameter at breast height, and crown diameter were collected in 157 Modified-Whittaker plots (20 m × 50 m). We performed a one-way ANOVA with Tukey's honest significant difference multiple comparisons computation. The highest density was recorded for *Anogeissus leiocarpa* individuals. Thus, we specified its dendrometric parameter as a control and applied Dunnett's general linear model method. Results showed significantly that dense dry forests recorded higher aboveground density (54.88%) than the other vegetation types. Aboveground biomass density per plant species varied between 1.156 ± 0.123 and 8.64 ± 0.001 Mg/ha. Stem biomass density (12.35 ± 1.33 Mg/ha) recorded the highest value (P < 0.001), whereas biomass densities of branches and leaves were 2.59 ± 0.26 Mg/ha and 0.41 ± 0.04 Mg/ha, respectively. Matrix scatterplots reported a positive significant quadratic relationship (P < 0.001). The highest R² of the regression ranged from 95.2 to 99.5% of the curvatures and confirms this close allometric correlation.

Effects of different harvesting intensities on the macronutrient pools in aged oak coppice forests. Pyttel, P., Bauhus, J.,

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Improved knowledge concerning nutrient removals through harvesting in former coppice forests is crucial for the sustainable management of these forests. This is especially true if the resumption of coppicing is being considered to serve increasing fuel wood demands. In this study, the nutrient contents of various tree compartments of sessile oak (*Quercus petraea* (Mattuschka) Liebl.) and hornbeam (*Carpinus betulus* L.) were determined to calculate the nutrients removed under different harvesting intensities. Independent of site and species, the highest nutrient concentrations were found in twigs and stem bark. Simple power functions to predict the nutrient content in the various tree parts showed high coefficients of determination (R² = 0.51 to 0.98). The comparison between the amount of nutrients stored in tree biomass and in soil indicated that sustainable nutrient management must consider different harvesting intensities according to site type. On sites with large soil nutrient pools, even whole trees can be harvested without causing deleterious effects. However, on sites with a low nutrient capital, current harvesting practices would result in high rates of nutrient export, and therefore exploitation of soil pools. In these stands, harvesting intensity should be based on careful selection of the tree compartments removed to conserve nutrients on site.