Artigos Científicos Publicados em 2018

Departamento de Engenharia Florestal (DEF)

Tabela de Conteúdo

Referência Completa do Artigo:

Zorrilla-Miras, Pedro, Mansour Mahamane, Marc J. Metzger, Sophia Baumert, Frank Vollmer, Ana Catarina Luz, Emily Woollen, Almeida A. Sitoe, Genevieve Patenaude, Isilda Nhantumbo, Casey M. Ryan, James Paterson, Maria Julieta Matediane, Natasha Sofia Ribeiro, and Isla M. Grundy. 2018. "Environmental Conservation and Social Benefits of Charcoal Production in Mozambique." Ecological Economics 144:100–111.

Resumo Original (Abstract):
Charcoal is an important source of energy and income for millions of people in Africa. Its production often drives forest degradation and deforestation which have impacts on the local people that remain poorly understood. We present a novel methodology for analysing the contribution of woodland ecosystem services (ES) to rural well-being and poverty alleviation, which takes into account access mechanisms to ES, trade-offs between ES, and human response options. Using a participatory approach, a set of land use change scenarios were translated into a probabilistic model that integrates biophysical and social data. Our findings suggest that in highly forested areas woodland degradation does not have a critical impact on the local use of the three ES studied: charcoal, firewood and grass. Social factors show the largest impact on the quantity of charcoal produced, e.g. female-headed households experience the greatest barriers to access charcoal production. Participating in forest associations and diversifying income activities lead to greater charcoal production. Results show that charcoal production increases some aspects of well-being (e.g. household assets), but does not decrease acute multidimensional poverty. Great efforts are required to reach a charcoal production system that alleviates poverty, improves environmental sustainability, and provides a reliable charcoal supply.

Palavras Chave (Keywords):
Bayesian Belief NetworksLand use Land Cover ChangePoverty AlleviationWell-beingEcosystem ServicesSocial-Ecological Systems

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Almeida Alberto Sitoe (Professor Catedrático, PhD)
- Natasha Sofia Ribeiro (Professora Associada, PhD)

Revista e Journal:
Elsevier, Ecological Economics

Link de Acesso ao Artigo:
https://doi.org/10.1016/j.ecolecon.2017.07.028

Referência Completa do Artigo:

Guedes, Benard S., Bengt A. Olsson, Almeida A. Sitoe, and Gustaf Egnell. 2018. "Net Primary Production in Plantations of Pinus Taeda and Eucalyptus Cloeziana Compared with a Mountain Miombo Woodland in Mozambique." Global Ecology and Conservation 15:e00414.

Resumo Original (Abstract):
Planting monocultures of fast-growing non-native (exotic) species is one way to slow or reverse deforestation and forest degradation in tropical zones. This study compared the effects on total net primary production (NPP) of first-rotation monoculture (34-year-old) plantations of Pinus taeda and Eucalyptus cloeziana and adjacent mountain miombo woodland in Mozambique. Total NPP was defined as the sum of annual carbon (C) sequestration in total aboveground tree biomass, belowground coarse root biomass, fine roots (≤2 mm) and fine litterfall. Field measurements were conducted over one year in three 30 m × 30 m permanent sampling plots for each forest type and involved monitoring litterfall and fine root production using in-growth cores and stem diameter growth. Carbon increment in aboveground tree biomass and belowground coarse root biomass was determined using allometric equations, for P. taeda, E. cloeziana, and root-to-shoot ratio, for miombo woodland. Major findings were that total NPP in P. taeda (14.1 Mg C ha−1 yr−1) and E. cloeziana (19.7 Mg C ha−1 yr−1) stands was significantly higher than in miombo woodland stands (5.9 Mg C ha−1 yr−1). These differences were largely attributable to lower basal area and presumably lower leaf biomass in miombo stands. There were several indications that the miombo stands studied had been degraded by selective cutting and other forms of use of forest resources. The difference in total NPP was also reflected in differences in patterns of C sequestration. Carbon in litterfall was the largest component of total NPP in miombo stands (41%), whereas C increment in aboveground tree biomass was the largest component of total NPP in plantation stands (44% in P. taeda and 51% in E. cloeziana). If the aim of forest management is to increase NPP and C sequestration in biomass of degraded miombo stands, our results indicate that replacement with plantations of P. taeda or E. cloeziana can be a useful management option, provided that the plantations are protected from anthropogenic disturbances, particularly fire. However, this aim needs to be balanced against other environmental aims and the socio-economic needs of local communities, since miombo woodland provides a wide range of unique economic, social and ecological benefits.

Palavras Chave (Keywords):
Carbon sequestrationFine rootsLitterfallDBH growth

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Benard Soares Guedes (Investigador Auxiliar, PhD)
- Almeida Alberto Sitoe (Professor Catedrático, PhD)

Revista e Journal:
Elsevier, Global Ecology and Conservation

Link de Acesso ao Artigo:
https://doi.org/10.1016/j.gecco.2018.e00414

Referência Completa do Artigo:

Guedes, Benard S., Bengt A. Olsson, Gustaf Egnell, Almeida A. Sitoe, and Erik Karltun. 2018. "Plantations of Pinus and Eucalyptus Replacing Degraded Mountain Miombo Woodlands in Mozambique Significantly Increase Carbon Sequestration." Global Ecology and Conservation 14:e00401.

Resumo Original (Abstract):
Total ecosystem carbon (C) stocks in tree biomass (aboveground and belowground), litter layer and soil (0–50 cm depth) were quantified in mountain miombo woodland and in 34-year-old first-rotation plantations of Pinus taeda and Eucalyptus grandis. The study was performed at three sites (Penhalonga, Rotanda and Inhamacari) in the western highlands of Manica province in Mozambique, bordering Zimbabwe. One 30 m × 30 m sampling plot was established for each forest type per site. Pre-tested allometric equations were used to determine total C stocks within aboveground tree biomass of each forest type and data from the literature on the relationship between aboveground and belowground biomass were used to estimate C stocks in belowground woody biomass (i.e. coarse roots). Measured soil and litter layer C data were taken from a previous study. Carbon stocks in mountain miombo woodland were used as a baseline to estimate C sequestration at the ecosystem scale, i.e. net ecosystem production (NEP) in the plantations, considering 34 years as stand age of the planted forests. Total ecosystem C stocks in miombo woodlands (~116 Mg ha−1) were significantly lower than in stands of P. taeda (363 Mg ha−1) and E. grandis (~407 Mg ha−1). Carbon sequestration rate at ecosystem scale (NEP) was 7.24 Mg ha−1 yr−1 in P. taeda stands and 8.54 Mg ha−1 yr−1 in E. grandis stands. NEP was dominated by the increment in biomass (~80%). This was also reflected in higher ratio between biomass C and soil organic C stocks in the plantations compared with miombo forest. The plantation species showed similar performance with respect to total C stocks and NEP. It was concluded that plantations of P. taeda or E. grandis have significant potential to increase C stocks and C sequestration rate in both soil and tree biomass on replacing degraded mountain miombo woodlands in the western highlands of Manica province.

Palavras Chave (Keywords):
Soil, Biomass, Net ecosystem production, Mozambique

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Benard Soares Guedes (Investigador Auxiliar, PhD)
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Revista e Journal:
Elsevier, Global Ecology and Conservation

Link de Acesso ao Artigo:
https://doi.org/10.1016/j.gecco.2018.e00401

Referência Completa do Artigo:

Guedes, B. S., A. A. Sitoe, and B. A. Olsson. 2018. "Allometric Models for Managing Lowland Miombo Woodlands of the Beira Corridor in Mozambique." Global Ecology and Conservation 13.

Resumo Original (Abstract):
Appropriate allometric models are urgently needed to assess the status and changes in biomass and carbon of the trees in miombo woodlands occupying large geographical areas in Mozambique. This study developed two new and interchangeable allometric models for estimating total above-ground biomass (AGB) of lowland miombo woodlands in the Beira corridor, central Mozambique, based on stem diameter at breast height (DBH) and stump diameter (SDI). The Beira corridor study area covers approximately 29,000 km2, of which about three-quarters is lowland miombo woodland. The SDI-based model is proposed principally for estimating total AGB (stem, branches, foliage) of harvested trees/shrubs when diameter cannot be measured at breast height, and thus to reconstruct the former biomass in forests subjected to logging, or clear-cutting for agriculture. The DBH-based model and SDI-based model were fitted using data on a destructive sample of 155 trees, which were representative of tree sizes (diameter and height) and tree species in the Beira corridor area. The following allometric models were developed: DBH-based model [tDW (kg tree−1) = 0.1754 * (DBH) 2.3238], with prediction performance, i.e. adjusted R-squared 98–99%; and SDI-based model [tDW (kg tree−1) = 0.08495 * (SDI) 2.3987], with prediction performance 86–96%. Carbon comprises 50% of biomass. Both the DBH- and SDI-based models can be used for estimating total AGB of lowland miombo woodlands with a high degree of reliability, based on field inventory within the Beira corridor region. Evaluation of the mathematical and statistical credibility of these models, which was carried out on the construction dataset (verification procedure) and independent dataset (validation procedure), gave satisfactory results. Moreover, when applied on our data, these models were more appropriate for the Beira corridor than allometric models found in the literature. However, application of both models should be restricted to the lowland miombo type in the Beira corridor, not mountain miombo.

Palavras Chave (Keywords):
DBH, Stump diameter, Biomass reconstructing model

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Benard Soares Guedes (Investigador Auxiliar, PhD)
- Almeida Alberto Sitoe (Professor Catedrático, PhD)

Revista e Journal:
Elsevier, Global Ecology and Conservation

Link de Acesso ao Artigo:
https://doi.org/10.1016/j.gecco.2018.e00374

Referência Completa do Artigo:

Bila, Narciso Fernando, Reinaldo Luis, Thaís Alves Pereira Gonçalves, Graciela Inés Bolzon de Muñiz, and Silvana Nisgoski. 2018. "Wood Anatomy of Five Species from Mozambique and Its Potential Application." Bosque (Valdivia) 39:169–75.

Resumo Original (Abstract):
Wood trade is strongly dependent on global economic conditions. In Africa, the market for tropical wood also has dynamic changes. In Mozambique, the international demand for wood comes mainly from emerging economies such as China and India. Almost 70 % of the country is still covered by forests and other woody vegetation. There are many species with favorable properties for wood commerce, although, at present, this is restricted to a few species. We analyzed the wood anatomy of Acacia nigrescens, Combretum imberbe, Icuria dunensis, Pericopsis angolensis and Sterculia appendiculata and comment about properties and potential use based on their anatomical composition. In general, the species presented wood diffuse pores, simple perforation plates, alternate intervessel pits, deposits in vessels; abundant axial parenchyma; multiseriate rays, very thick-walled fibers and mineral inclusions. Based on anatomical characteristics, the studied species have great potential for use in panels industry, furniture, floor, structures and craftwork.

Palavras Chave (Keywords):
Africa; native species; wood structure; wood use

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Narciso Fernando Bila (Investigador Auxiliar, PhD)
- Reinaldo Calçada Guina Luís (Investigador Assistente, MSc)

Revista e Journal:
SciELO Analytics, Bosque (Valdivia)

Link de Acesso ao Artigo:
https://doi.org/10.5897/JMPR2017.6540

Referência Completa do Artigo:

Gumbo, Davison, Jessica Clendenning, Christopher Martius, Kaala Moombe, Isla Grundy, Robert Nasi, Kondwani Y. Mumba, Natasha Ribeiro, Gillian Kabwe, and Gillian Petrokofsky. 2018. "How Have Carbon Stocks in Central and Southern Africa's Miombo Woodlands Changed over the Last 50 Years? A Systematic Map of the Evidence." Environmental Evidence 7(1):16.

Resumo Original (Abstract):
Miombo woodlands cover ≈ 2.7 million km2 of central and southern Africa between dry (650 mm mean annual rainfall) and moist miombo (1400 mm) and are currently threatened by land use and land cover changes that have intensified over the last 50 years. Despite the miombo's global significance for carbon (C) storage and sequestration, there has been no regional synthesis that maps carbon stocks and changes in the woodlands. This information is crucial to inform further research for the development of appropriate policies and management strategies to maintain and increase C stocks and sequestration capacity, for conservation and sustainable management. We assembled a systematic map to determine what evidence exists for (1) changes in carbon stocks in miombo woodlands over the period 1960–2015; (2) differences in carbon density in miombo with different conservation status; (3) trends in carbon stock recovery following human disturbance; and (4) fire management impacts on carbon stocks and dynamics. We screened 11,565 records from bibliographic databases and grey literature sources following an a priori research protocol. For inclusion, each study had to demonstrate the presence of miombo-typical species (Brachystegia, Julbernardia and Isoberlinia) and data on above- or below-ground carbon stocks or plant biomass. A total of 54 articles met the inclusion criteria: 48 quantitative and eight qualitative (two of which included quantitative and qualitative) studies. The majority of studies included in the final analyses are largely quantitative in nature and trace temporal changes in biomass and carbon in the miombo woodlands. Studies reported a wide range (1.3–95.7 Mg ha−1) of above-ground carbon in old-growth miombo woodland. Variation between years and rainfall zones and across conservation area types was large. An insufficient number of robust studies that met our inclusion criteria from across the miombo region did not allow us to accurately pool carbon stocks and trends in miombo old growth. Thus, we could not address the four questions originally posed in our protocol. We suggest that future studies in miombo woodlands take longer term observational approaches with more systematic, permanent sampling designs, and we identify questions that would further warrant systematic reviews, related to differences in C level recovery after disturbance in fallow and post-clearing re-growth, and the role of controlled fire management.

Palavras Chave (Keywords):
Biomass, Brachystegia, Carbon stocks, Conservation area status, Fire management, Isoberlinia, Julbernardia, Old-growth, Re-growth, Soil organic matter.

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Natasha Sofia Ribeiro (Professora Associada, PhD)

Revista e Journal:
BMC, Environmental Evidence

Link de Acesso ao Artigo:
https://doi.org/10.1186/s13750-018-0128-0

Referência Completa do Artigo:

Moura, I., Duvane, J. A., Silva, M. J., Ribeiro, N., & Ribeiro-Barros, A. I. (2018). Woody species from the Mozambican Miombo woodlands: A review on their ethnomedicinal uses and pharmacological potential. Journal of Medicinal Plants Research, 12(2), 15-31.

Resumo Original (Abstract):
Miombo woodlands cover about two thirds of Mozambique national territory. They provide a wide collection of goods and services to the formal and informal economies. A review on the traditional uses of 15 Miombo tree species in human and animal health, as well as the status of research towards the identification of bioactive compounds is presented. Among the 15 species selected, 12 have been screened for their biological activity and/or pharmacological properties and/or toxicity. The information gathered in this work is a key to further exploit potential new uses and future opportunities for research and valorization of the selected species.

Palavras Chave (Keywords):
Ethnobotanical, medicinal plants, Miombo woodlands, non timber forest products

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Natasha Sofia Ribeiro (Professora Associada, PhD)

Revista e Journal:
Academic Journals, Journal of Medicinal Plants Research

Link de Acesso ao Artigo:
https://doi.org/10.5897/JMPR2017.6540

Referência Completa do Artigo:

Natasha Sofia Ribeiro Messina, Mario, Robert Cunliffe, Alessio Farcomeni, Luca Malatesta, Izak P. J. Smit, Riccardo Testolin, Natasha S. Ribeiro, Bruno Nhancale, Marcello Vitale, and Fabio Attorre. 2018. "An Innovative Approach to Disentangling the Effect of Management and Environment on Tree Cover and Density of Protected Areas in African Savanna." Forest Ecology and Management 419–420:1–9.

Resumo Original (Abstract):
In protected areas of the African savanna tree cover, structure and species composition are influenced by a combination of many different variables. These include complex and multi-scaled interplay of environmental factors such as water and nutrient availability, fire, herbivory and, when occurring, direct human disturbance. In this study, we conducted a comprehensive and comparative analysis of the spatial variability of tree cover and density in three neighboring Southern African National Parks (Kruger, Limpopo, and Gonarezhou) characterized by similar environmental conditions but different management plans. We sampled 3382 plots of 0.5 ha across the three parks using an innovative methodology defined as augmented visual interpretation, based on a free and open-source software. This software, named Collect Earth, allows access to very high spatial and temporal resolution imagery archives. Spatial variability of tree cover and density was analyzed comparing the three parks and the two bioclimatic regions (semiarid and dry subhumid) characterizing them. The effect of relevant environmental variables such as edaphic factors, precipitation and fire frequency was also assessed. Kruger National Park is characterized by the lowest values of tree cover and density among the three Parks. Contrary to what was expected and the general trend of Southern Africa, the dry subhumid zone showed lower values of tree cover and density than the semiarid zone. Such variability is hypothesized to be related to the different managements of the three parks within the general environmental template characterizing the African savanna as well as differences in tree species composition between the two climatic zones.

Palavras Chave (Keywords):
Collect Earth, Fire frequency, Kruger National Park, Gonarezhou National Park, Limpopo National Park, Soil

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Natasha Sofia Ribeiro (Professora Associada, PhD)

Revista e Journal:
Elsevier, Forest Ecology and Management

Link de Acesso ao Artigo:
https://doi.org/10.1016/j.foreco.2018.03.019

Referência Completa do Artigo:

LUIS, Reinaldo Calçada Guina; NISGOSKI, Silvana and KLITZKE, Ricardo Jorge. Effect of Steaming on the Colorimetric Properties of Eucalyptus saligna Wood. Floresta Ambient. [online]. 2018, vol.25, n.1, e00101414. Epub Mar 19, 2018. ISSN 2179-8087.

Resumo Original (Abstract):
This study aimed to homogenize the color of Eucalyptus saligna wood by means of steaming and compare the resulting color with that of Cariniana legalis wood, a species of high commercial value. To this end, two steaming curves were tested: 100% relative humidity for 12 (T1) and 24 (T2) hours at 90 °C followed by drying in a pilot-scale conventional kiln. The colorimetric parameters L*, a*, b*, C*, and h were determined according to the CIE L*a*b* color measurement system after drying. Results showed that steaming can be used for color homogenization between heartwood and sapwood. The treatment conducted for 24 hours (T2) presented the best results.

Palavras Chave (Keywords):
Wood colour; Heat treatment; Alternative species

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Reinaldo Calçada Guina Luís (Investigador Assistente, MSc)

Revista e Journal:
SciELO Analytics, Floresta Ambient.

Link de Acesso ao Artigo:
https://doi.org/10.1590/2179-8087.101414

Referência Completa do Artigo:

Aires Mbanze, Daniel Salvador Castilho, Custódio Matavel, Romana Bandeira, Carlos Fernado Jairoce. 2018. Efficacy of Three Insecticides in the Control Gall Wasp Leptocybe invasa in Eucalyptus urograndis Seedlings. American Journal of Agriculture and Forestry. Vol. 6, No. 6, 2018, pp. 246-252.

Resumo Original (Abstract):
Forestry expertise and plantations managers are struggling to find cheaper and sustainable solutions to contain the losses caused by Leptocybe invasa in the last nine years on the forest stands in Mozambique. Aiming to help find a solution in the control of L. invasa early in the nursery, we conducted an experimental trial at the Niassa Forestry company nursery, located in the Niassa province, northern Mozambique in February 2015. Three insecticides: Acetamiprid, Thiamethoxam, Imidacloprid, with and without adherent and pH regulator were tested. The experiment had seven treatments including the control. The number of seedlings infested by the gall wasp were assessed 15, 30, 45 and 60 days after the seeds were sown in the nursery. Data were analysed in R package. Normality and homogeneity of variances were tested through Shapiro-Wilk and Bartlett's tests respectively. Analysis of Variance (ANOVA) and parametric means test (Tukey-HSD), were used to assess whether there was difference among the treatments. Results showed difference between treatments at 0.01% of significance after 15, 30 and 45 days and at 5% in the 60 days after sowing. With less seedlings infested by the gall wasp, Imidacloprid with and without adherent was almost superior compared to all other pesticides in all assessment. The use of adherent and pH regulators negatively affected the performance of insecticides, except in the Imidacloprid. This study findings should not however, be overall generalized, instead, more research can be conducted to verify the consistency of these results before being widely implemented.

Palavras Chave (Keywords):
Eucalyptus Seedlings, Planted Forest, Insecticides and L. Invasa

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Romana Rombe Bandeira (Professora Associada, PhD)

Revista e Journal:
Science PG, American Journal of Agriculture and Forestry.

Link de Acesso ao Artigo:
https://www.google.com/search?client=safari&rls=en&q=doi:+10.11648/j.ajaf.20180606.22&ie=UTF-8&oe=UTF-8

Referência Completa do Artigo:

Smith, Harriet Elizabeth, Daniel Jones, Frank Vollmer, Sophia Baumert, Casey M. Ryan, Emily Woollen, Sá N. Lisboa, Mariana Carvalho, Janet A. Fisher, Ana C. Luz, Isla M. Grundy, and Genevieve Patenaude. 2019. "Urban Energy Transitions and Rural Income Generation: Sustainable Opportunities for Rural Development through Charcoal Production." World Development 113:237–45.

Resumo Original (Abstract):
Sub-Saharan Africa's charcoal sector is rarely considered a mechanism for rural development or poverty alleviation; instead, current regulations often marginalise rural producers. The development of a sustainable sector, that does not further marginalise rural populations, is restricted by limited understanding of these stakeholders. We assess the heterogeneity of rural producers supplying two differentially sized urban charcoal markets in Mozambique. Drawing on data from 767 household surveys, our findings suggest that the size of the urban market affects the type of rural producer and their scales of production. Overall household income of producers supplying the larger urban market were proportionally more dependent on charcoal for income generation; small-scale producers in particular relied most on charcoal income, contributing >95% of household incomes. In contrast, producers supplying the smaller market had more diversified incomes, and were thus less dependent on charcoal income. Larger-scale producers were generally wealthier; their absolute incomes were higher and they were proportionally the least dependent on charcoal income. Further findings suggest that rural charcoal production was not necessarily the domain of the poorest of the poor and the existence of producers trapped in small-scale production may be a consequence of larger urban markets, rather than an intrinsic characteristic of the sector. Predicted growth of smaller urban areas and associated higher demand for charcoal will provide substantial opportunities for rural income generation, most likely leading to shifts in producers and production scales. Rather than transferring existing formal approaches, which marginalise rural stakeholders, small urban areas provide opportunities to develop equitable production systems, with potential to deliver sustainable energy and rural development. The heterogeneity of rural producers calls for better-targeted interventions that incorporate the importance of charcoal production for rural livelihoods.

Palavras Chave (Keywords):
Livelihoods, Poverty, Africa, Smallholder, Woodfuel, Charcoal

Quadro (s) do Departamento de Engenharia Florestal envolvido(s):

- Sá Nogueira Lisboa (Assistente Universitário, MSc)

Revista e Journal:
Elsevier, World Development

Link de Acesso ao Artigo:
https://doi.org/10.1016/j.worlddev.2018.08.024

Referência Completa do Artigo:

Lisboa, Sá Nogueira, Benard Soares Guedes, Natasha Ribeiro, and Almeida Sitoe. 2018. "Biomass Allometric Equation and Expansion Factor for a Mountain Moist Evergreen Forest in Mozambique." Carbon Balance and Management 13(1):23.

Resumo Original (Abstract): Worldwide, forests are an important carbon sink and thus are key to mitigate the effects of climate change. Mountain moist evergreen forests in Mozambique are threatened by agricultural expansion, uncontrolled logging, and firewood collection, thus compromising their role in carbon sequestration. There is lack of local tools for above-ground biomass (AGB) estimation of mountain moist evergreen forest, hence carbon emissions from deforestation and forest degradation are not adequately known. This study aimed to develop biomass allometric equations (BAE) and biomass expansion factor (BEF) for the estimation of total above-ground carbon stock in mountain moist evergreen forest. The destructive method was used, whereby 39 trees were felled and measured for diameter at breast height (DBH), total height and the commercial height. We determined the wood basic density, the total dry weight and merchantable timber volume by Smalian's formula. Six biomass allometric models were fitted using non-linear least square regression. The BEF was determined based on the relationship between bole stem dry weight and total dry weight of the tree. To estimate the mean AGB of the forest, a forest inventory was conducted using 27 temporary square plots. The applicability of Marzoli's volume equation was compared with Smalian's volume equation in order to check whether Marzoli's volume from national forest inventory can be used to predict AGB using BEF. The best model was the power model with only DBH as predictor variable, which provided an estimated mean AGB of 291 ± 141 Mg ha−1 (mean ± 95% confidence level). The mean wood basic density of sampled trees was 0.715 ± 0.182 g cm−3. The average BEF was of 2.05 ± 0.15 and the estimated mean AGB of 387 ± 126 Mg ha−1. The BAE from miombo woodland within the vicinity of the study area underestimates the AGB for all sampled trees. Chave et al.'s pantropical equation of moist forest did not fit to the Moribane Forest Reserve, while Brown's equation of moist forest had a good fit to the Moribane Forest Reserve, having generated 1.2% of bias, very close to that generated by the selected model of this study. BEF showed to be reliable when combined with stand mean volume from Marzoli's National Forestry Inventory equation. The BAE and the BEF function developed in this study can be used to estimate the AGB of the mountain moist evergreen forests at Moribane Forest Reserve in Mozambique. However, the use of the biomass allometric model should be preferable when DBH information is available.

Palavras Chave (Keywords):
Above-ground tree biomass, Carbon stock, Pan-tropical equation, Biomass expansion factor

Quadro (s) do Departamento de Engenharia Florestal envolvido (s):

- Sá Nogueira Lisboa (Assistente Universitário, MSc)
- Benard Soares Guedes (Investigador Auxiliar, PhD)
- Natasha Sofia Ribeiro (Professora Associada, PhD)
- Almeida Alberto Sitoe (Professor Catedrático, PhD)

Revista e Journal:
BMC, Carbon Balance and Management

Link de Acesso ao Artigo:
https://doi.org/10.1186/s13021-018-0111-7

Referência Completa do Artigo:

Magalhães, Tarquinio Mateus and Rosta Simão Mate. 2018. "Least Squares-Based Biomass Conversion and Expansion Factors Best Estimate Biomass than Ratio-Based Ones: Statistical Evidences Based on Tropical Timber Species." MethodsX 5:30–38.

Resumo Original (Abstract):
Due to its readiness to convert stem volumes (V) into biomass, national and regional aboveground biomass estimates and greenhouse gas reporting are generally based on biomass conversion and expansion factors (BCEFs). BCEF-based biomass (W) is computed by the following regression through the origin (RTO): W?=?BCEF?×?V. However, the regression slope (BCEF) is not obtained using least squares (LS); it is obtained as the ratio of observed biomass and stem volume. Therefore, the sum of squares of the residuals is not minimum. This may lead to strongly biased biomass estimates. Furthermore, in this case, the biomass is not modelled. In the present study, it was suggested that BCEFs should be obtained using LS through RTO. The objective of this study was to compare LS-based and ratio-based BCEFs with regard to predictive accuracy and ability. A dataset of 75 trees from 4 species was used for the comparisons. LS-based BCEFs were associated with higher predictive accuracy and ability than ratio-based ones. It was proved that RTO is appropriated for estimating BCEFs, as the intercept a was consistently not significant. Ratio-based BCEFs may lead to seriously biased biomass and carbon stocks estimates. BCEFs should be estimated using least squares.

Palavras Chave (Keywords):
Biomass, Biomass conversion and expansion factors, Miombo, Mopane

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

- Tarquinio Mateus Magalhães (Professor Auxiliar, PhD)
- Rosta Simião Mate (Professora Auxiliar, PhD)

Revista e Journal:
Elsevier, MethodsX

Link de Acesso ao Artigo:
https://doi.org/10.1016/j.mex.2018.01.005

Referência Completa do Artigo:

Michael Pockrandt, Mohamed Jebrane, Ignazia Cuccui, Ottaviano Allegretti, Ernesto Uetimane Jr. and Nasko Terziev. 2018. Industrial Thermowood® and Termovuoto thermal modification of two hardwoods from Mozambique. Holzforschung, Volume 72, Issue 8, Pages 701–709, eISSN 1437-434X, ISSN 0018-3830.

Resumo Original (Abstract):
The study aimed at treating metil (Sterculia appendiculata K. Schum) and neem (Azadirachta indica A. Juss) timber from Mozambique under industrial condi- tions by steam [Thermowood® (TW)] and vacuum [Termo- vuoto (TV)] thermal modifications (TM). Matched boards were treated identically and wood alterations in chem- istry, colour, mass loss (ML), mechanical properties and durability were compared. The applied vacuum partly removed the acetic acid that causes carbohydrate degra- dation, i.e. heat applied under vacuum was less destruc- tive. TM under vacuum generated a lighter colour than that caused by steam treatment. ML was significantly higher after the TW process namely, 14.1 vs. 9.9% after thermo- vacuum treatment for metil and 14.2 and 12.1% for neem. Colour and ML changes correlated with the decrease in shear strength, rupture and elasticity moduli and increase in wood decay resistance. Metil wood is more permeable and demonstrated significant differences between the treatments; the thermo-vacuum process was less destruc- tive but led to less improvement of durability compared to TW treatment.

Palavras Chave (Keywords):
Azadirachta indica A. Juss, chemical changes, mass loss, mechanical properties, physical proper-ties, Sterculia appendiculata K. Schum, thermal wood modification

Quadro (s) do Departamento de Engenharia Florestal envolvidos:

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Referência Completa do Artigo:

Ernesto Uetimane Jr., Mohamed Jebrane, Nasko Terziev, Geoffrey Daniel. 2018. Comparative Wood Anatomy and Chemical Composition of Millettia mossambicensis and Millettia stuhlmannii from Mozambique. BioResources, Vol 13, No 2. Pages 3335-3345

Resumo Original (Abstract):
The wood anatomy and chemistry of a relatively lesser used wood species, known in Mozambique as nsangala (Millettia mossambicensis J. B. Gillett), was compared to overexploited species jambire (Milletia stuhlmannii Taub.) to provide diagnostic features for safe discrimination. The anatomical results showed that both species shared several similarities such as intervessel pitting size range (8 μm to 11 μm), rays composed of only procumbent cells, fiber dimensions (average length up to 1359 μm and wall thickness up to 10 μm), and banded axial parenchyma. The extractives and lignin content were higher in jambire, while the carbohydrates and acetyl contents were higher in nsangala. The main anatomical feature separating the two species was the porosity pattern with semi-ring porous wood of nsangala compared to the diffuse-porous structure of jambire. Jambire had wider vessel lumina (200 μm) and up to 3 vessels/mm2 compared to nsangala vessel lumina of 86 μm and a frequency of 37 vessels/mm2.

Palavras Chave (Keywords):
Chemical composition; Illegal logging; Millettia mossambicensis; Millettia stuhlmannii; Wood anatomy

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