

levels and the population decline of high-density stands, including at strict nature reserves. The initial hypothesis of seed overharvesting lacks consensus as later studies identified the scarcity of canopy gaps at mature forests as the main cause for the recruitment failure of this gap-loving species. This observation supports the anthropogenic origin hypothesis and is consistent with the abundant recruitment observed in traditional swiddens, where the regeneration density increases with the number of cultivation cycles. This is due to a number of factors, including the scatterhoarder habit of the natural disperser, gap-clearance frequency, species' resistance to fire and remarkable re-sprouting capability. Nut-gatherers intuitively understand the role of swiddens for the maintenance and expansion of high-density Brazil nut stands, and many voluntarily protect their spontaneously enriched fallows from further cultivation cycles. Surprisingly, the very conservation policies end up hindering such traditional management practices. For example, when forbidding nut-gatherers/swidden-farmers from clearing new plots of forest in exchange for those fallows they chose to protect. Expensive, labor-intensive and unpopular recommendations like enrichment planting are puny alternatives for what the ubiquitous swiddens can do, provided revised policies allow them to. Failing that, densities of senescent Brazil nut stands will continue to decrease until hardly justifying the "sustainable alternative to deforestation" discourse.

Morphometry of *Araucaria angustifolia* at different altitudes in Southern Brazil applied in the identification of critical growth points

Pollyni Ricken¹ , André Felipe Hess², Patrícia Póvoa de Mattos³ , Nelson Yoshihiro Nakajima¹, Roberto Tuyoshi Hosokawa¹

¹Universidade Federal do Paraná, Curitiba, Brasil; ²Universidade do Estado de Santa Catarina, Lages, Brasil; ³Embrapa Florestas, Colombo, Brasil (pollyni7@hotmail.com; andre.hess@udesc.br; patricia.mattos@embrapa.br; nelson.nakajima@ufpr.br; roberto.hosokawa@pq.cnpq.br)

The aim of this study was to use morphometric characteristics of *Araucaria angustifolia*, as basis to elaborate management plans. Data was collected in three sites of Santa Catarina State: S1 (altitude of 1,350 m), S2 (1,150 m) and S3 (950 m). Random sampling and Bitterlich method were applied using 2 as basal area factor. We sampled 247 individuals (77 at S1, 93 at S2 and 77 at S3). The degree of indexes association was examined by Pearson correlation coefficient. S2 was constituted by larger trees, indicating better growth conditions. S3 presented the highest density of trees (403 trees.ha⁻¹), while at S1 and S2 there were 362 and 188 trees.ha⁻¹, respectively. At S3 most trees had a crown proportion greater than 50% and crown formal smaller than 1, reflecting trees with narrower and longer crowns. The height/diameter ratio was similar among sites (0.4 to 0.5). Diameter correlation with slenderness ratio was negative and bigger than 70%. In all sites diameter at 1.30 m from ground level (DBH) showed positive relation with crown diameter, indicating that as trees increase in DBH, crown diameters also increase. The removal of competing trees becomes essential to increase growth rate by increasing space and light incidence. Morphometric indexes can be used to support sustainable forest management plans, allowing the identification of critical points related to the trees development pattern.

Adapting the Prodan method for sampling species associated with *Araucaria angustifolia* (Bertol.) Kuntze / Adaptação do uso do método de Prodan para amostragem de espécies associadas a *Araucaria angustifolia* (Bertol.) Kuntze

Joelmir Augustinho Mazon^{1,2}, Richeliel Albert Rodrigues Silva^{1,3}, Luciano Farinha Watzlawick¹

¹Universidade Estadual do Centro Oeste, Guarapuava, Brasil; ²Faculdade Guairacá Guarapuava Brasil; ³Universidade Federal do Rio Grande do Norte Natal, Brasil (joelmir23@hotmail.com; richelielufrn@gmail.com; farinha@unicentro.br)

Este trabalho objetivou a adaptação do método de amostragem de área variável de Prodan para o estudo de espécies de porte arbóreo que ocorrem com maior frequência próximas à Araucária (*Araucaria angustifolia*), considerando estas como espécies associadas desta espécie. Para tanto, percorreram-se cinco transectos equidistantes paralelamente em 100 metros, totalizando 1.830 metros de caminhada em um fragmento de Floresta Ombrófila Mista de 22 hectares no Parque Natural Municipal das Araucárias, em Guarapuava, PR. A aplicação do método consistiu na demarcação de indivíduos de Araucária ao longo de cada transecto, utilizando-os como ponto central para a unidade amostral e a cada destes, determinou-se o raio das seis árvores mais próximas, as quais foram identificadas taxonomicamente e classificadas quanto à sua frequência absoluta. Foram mensurados 55 indivíduos de Araucária ao longo de todos os transectos, cujo os diâmetros variaram em média 71,5 ± 26,8 cm, contemplando uma área total amostrada de 0,54 hectares e um total 38 espécies encontradas. As espécies mais frequentemente identificadas consideradas como associadas da Araucária foram: *Campomanesia xanthocarpa* O. Berg, que ocorreu próxima de 51% das Araucárias observadas, *Casearia decandra* Jacq. (34,5%), *Gymnanthes klotzschiana* Müll. Arg. (30,1%), *Araucaria angustifolia* e *Cinnamodendron dinisii* Schwanke (27,3%), *Allophylus edulis* (A. St-Hil., Cambess e A. Juss.) Radlk (20%) e *Matayba elaeagnoides* Radlk. (18,2%). A adaptação do método de Prodan mostra-se uma ferramenta útil para o entendimento da ecologia e fitossociologia da *Araucaria angustifolia*, podendo ser utilizada para projetos de manejo e conservação desta espécie icônica e tão ameaçada no Brasil devido a sua importância econômica.

Genetic analysis of growth curves of individual trees and country-wide provenances of *Araucaria angustifolia* shows huge potential for enhanced domestication, breeding and conservation of this iconic Brazilian conifer

Rafael Tassinari Resende¹, Pedro Tanno², Orzenil Bonfim Silva-Junior³, Ananda Virginia de Aguiar⁴, Valderês Aparecida de Sousa⁴, Alexandre Sebbenn^{5,6}, Dario Grattapaglia^{3,7}

¹Universidade Federal de Goiás, Goiânia, Brasil; ²Universidade de Brasília, Brasília, Brasil; ³Embrapa Recursos Genéticos e Biotecnologia, Brasília, Brasil; ⁴Embrapa Florestas, Colombo, Brasil; ⁵Instituto Florestal de São Paulo, São Paulo, Brasil; ⁶Universidade Estadual Paulista "Júlio de Mesquita Filho", Ilha Solteira, Brasil; ⁷Universidade Católica de Brasília, Brasília, Brasil (rafael.tassinari@gmail.com; tanno.pedro@gmail.com; orzenil.silva@embrapa.br; ananda.aguiar@embrapa.br; valderes.sousa@embrapa.br; alexandresebbenn@yahoo.com.br; dario.grattapaglia@embrapa.br)

Understanding the growth behavior of forest tree species is important for early selection, and to understand ecological patterns, predict future biomass and adaptive tree fitness. We investigated the genetic variation for growth traits of *Araucaria angustifolia* in a trial involving 122 families from 15 provenances from three Brazilian regions. Measurements at ages 7, 24, 32, 33 and 35 were used to adjust continuous growth curves based on nonlinear mixed-effect models for all 2,158 trees, providing estimates for unmeasured ages in the 7-35 interval. Estimated values closely matched observed ones and a reduction of the coefficient of residual variation was observed in the estimated data, possibly due to removal of random error in observed measurements, making the estimated curves more reliable to predict growth patterns. Genetic variation within provenances was greater than between, with a trend of increasing heritabilities over time for most provenances. Growth curves show that trees invest first in DBH and later in height, and even at age 35 *A. angustifolia* does not show biomass growth stagnation. Provenances with great potential for breeding and genetic conservation were identified with variable adaptation to support global climate and landscape change. The data clearly indicate potential for early selection at age 7-10 with 85% accuracy of selection at age 35, and possibility of shortening rotation age to 15-20 years by selecting the best individuals and families. These results underscore the huge potential of expanding investments in breeding and plantation forestry of *A. angustifolia* with a concomitant enhancement of conservation efforts.