the sustainability of forest production systems under rapid climate change, this study aims to evaluate selected clones to frost survival using chambers with controlled environmental conditions, simulating the Brazilian frost events. The frost damage was estimated to one hundred Eucalyptus clones through evaluation of leaves hurt. Before the frozen, the seedlings were acclimated during 24 hours without, to later be submitted to artificial frozen, where the local temperature decreases as of $-1 \,^{\circ}$ C unto $-5 \,^{\circ}$ C. The results pointed *E. grandis* as the most susceptible species, followed by hybrids and clones from *E. viminalis, E. dunnii* and *E. banjensis*. At $-5 \,^{\circ}$ C only clones from *E. dunnii* and *E. banjensis* species were resistant. Moreover, at $-1 \,^{\circ}$ C nine hybrids were better than *E. viminalis* clones. The ANOVA claims the existence of high genetic structure related to low-temperature resilience, with heritability around 50% and an environmental coefficient near to 14%. The average frost resilience of fifteen best-scored clones was 25% higher than other ones. Therefore, the controlled environmental chambers are useful to evaluate the resilience of forest species to environmental changes scenarios, allowing the adoption of operational solutions to prepare the forest-based sector to the climatic changes.

Analysis of substrates for transplanting native seedling species cultivated in vitro / Análise de substratos para transplantio de mudas nativas cultivadas in vitro

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Dentre os métodos de conservação de florestas nativas, a estratégia ex situ tem sido utilizada de forma complementar às estratégias in situ e on farm, auxiliando na minimização das potenciais perdas de diversidade genética causadas pelos impactos do desmatamento e das mudanças climáticas. Um dos métodos de conservação ex situ é a micropropagação que visa a produção de grandes quantidades de mudas a partir de uma única célula ou tecido vegetal. Para integrar pesquisa e ensino, no presente trabalho, alunos da disciplina de biotecnologia florestal realizaram um experimento de propagação de mudas a partir de plantas nativas da flora brasileira cultivadas in vitro: *Euterpe precatoria* (açaí-solteiro); *Ananas comosus* (abacaxizeiro) e *Guadua chacoensis* (bambu). Após a micropropagação, foram testados dois tipos de substratos para a avaliação da sensibilidade/tolerância ao transplantio: 1) substrato comercial (uma mistura 1:1 de casca de coco e húmus de minhoca) e 2) solo argiloso. Copos de plástico transparentes de 300 mL foram preenchidos com os diferentes substratos sendo realizadas duas repetições por tratamento. O substrato e o solo foram encharcados com água (25-50 mL) para o transplantio e estes foram cobertos com o mesmo tipo de copo transparente para simular o ambiente in vitro facilitando a aclimatação das mudas. Após 6 dias, foram observados o índice de pegamento que resultou em 100% constatando-se que não houve diferença entre os substratos.

Effect of diffent methods of pretreatment for dormancy breaking for higher germination of Leucaena leucacephala Seeds

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The main objective of this study was to determine the effect of different seed dormancy breaking methods and best exposure time regime of *leucaena leucocephala* seeds for mass multiplication. Tree seeds of *Leucaena leucocephala* were sourced from Kenya Forestry Seed Centre stored and subjected to different pretreatment methods ranging from soaking in sulphic acid at different concentration and time, soaking in hot water at different temperature and time, soaking in cold time and service scarification. Higher germination of 96% was shown by seeds soaked in hot water at 1000 °C for 24 hours followed by those soaked at 100% concentrated sulphic acid for 3hrs, scarification and cold water in that order for 15 days. Germination percentage declined with increase of both sulphic acid concentration and soaking time at different constant concentration ranging from 50% to 100%. Equally germination percentage declined with decrease of both water temperature and soaking time at different constant temperature ranging from 1000 °C to 500 °C. The results obtained will be applied in mass germination for mass seedlings production with inform germination at shorter period for increased fodder production.

Effect of indolebutyric acid in treating cuttings of *Bambusa vulgaris* Schrad. ex J.C.Wendl. / *Efeitos do ácido indolbutírico no tratamento de Estacas de Bambusa vulgaris Schrad. Ex J.C.Wendl.*

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A presente pesquisa objetivou-se avaliar os efeitos do Ácido Indolbutírico (AIB) em diferentes concentrações na emissão de brotações, comprimento de ramos e enraizamento de estacas de *Bambusa vulgaris* Schrad. ex J.C.Wendl. O experimento foi conduzido em casa de vegetação na Universidade Estadual do Sudoeste da Bahia-UESB, no município de Vitória da Conquista-BA, Brasil. Para a instalação do experimento, as estacas foram imersas por 10 segundos em solução com ácido indolbutírico (AIB), diluído com hidróxido de sódio em quatro concentrações (0, 1.000, 2.000, e 3.000 mg.L⁻¹) correspondentes aos quatro tratamentos. Usou-se quatro repetições e 10 estacas em cada amostra. As estacas, após tratadas com as respectivas soluções, foram transplantadas para tubetes com capacidade volumétrica de 288 cm³, já preenchidos com o substrato e na posição vertical com o nó basal na profundidade de 5,0 cm. Avaliou-se: a) número de brotações; b) número e comprimento de ramos; c) área foliar; e d) número de raízes. Entre as concentrações de AIB, os efeitos foram similares para número e comprimento de ramos, todavia, para as demais variáveis o AIB usado na concentração 1000 mg.L⁻¹ exerceu efeitos positivos, destacando-se o aumento do número de raízes quatro vezes maior, quando comparado com a concentração Controle, demonstrando portanto, a sua eficiência no enraizamento de estacas dessa espécie.

Beyond restoration success: searching for long term economical sustainability of successional biodiversity-rich agroforestry at the tropical Atlantic rainforest dominion, Brazil

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On going and past researches demonstrates the positive environmental and social changes brought by agroforest practices adoption and maintenance by peasants at the tropical Atlantic rainforest dominion of the vale do Ribeira region, Brazil. During the succession process at agroflorestas plots, short-lived species are

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gradually replaced by long-lived species, aiming to provide continuous food production and to ultimately become a multilayer food production forest system. But one noticeable fact is that once the agroforest plots reaches a forest structure, they do not yield enough marketable products and are cut down or abandoned. This is due to the lack of adequate planning for the latter phases of succession, which is a consequence of planning emphasis on diversity richness and ecological niche filling paradigms. One other aspect on question is that the labor necessary to execute the ongoing management plan is much greater than the labor that the peasants are able or willing to spend. There are some possible alternatives to generate income from the later succession phases of agroforestry, such as agroecoturism structuring, simplification of agroforest design and a shift to productive chains and market analysis paradigms. Our research efforts aims to find and implement mature agroforest planning and management based on focal species that yield an already market consolidated and valuable product, have a relatively low labor demand and establishes viable populations with no need of further reintroduction. Many of the peasants are reluctant to accept the necessary paradigm change, but there are others that are joining us on this effort.

Chemical changes in a series of consecutive rhizome of Gigantochloa scortechinii in relation with hydraulic conductance

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The aim of this study was to 1) determine the variation of chemical attributes among study sites, 2) define the chemical attributes changes during maturation period of rhizome, and 3) investigate is there any relationship of chemical attributes with hydraulic conductance (Kbg). Bamboo rhizome is important as for storage, translocation and reproduction system. This translocation function is hypothesized to significantly affect by the chemical attributes changes during maturation period of rhizome. Therefore there is an interest to investigate the variation of chemical attributes in a consecutivebamboo rhizome ages. The destructive sampling method was conducted using selective random sampling method on four consecutive rhizomes from healthy *Gigantochloa scortechinii* clumps. Sampling was conducted at two natural forests and one secondary forest (planted). The chemical attributes were examined according to TAPPI standard method except for the holocellulose. Results indicate that the ash content (AC), alcohol-acetone soluble (AAS) and holocellulose (HC) were significant different (p < 0.01) among study sites. Furthermore, AC, hot water soluble (HWS), AAS, lignin (L), and HC were found significantly different (p < 0.01) with a strong relationship (r = -0.823, 0.688, 0.945, 0.510 respectively) with rhizome age. The AC showed a significant (p < 0.01) positive relationship (r = -0.706, -0.914, -0.857, -0.567 respectively) with Kbg which depicted that the increasing of those chemical attributes in increasing of rhizome age resulted to decreasing of rhizome age resulted to decreasing of Kbg.

C3b: DIGITAL TRANSFORMATION IN WOOD INDUSTRY

X-ray determination of moisture content in wood biofuel assortments for bioenergy plant process control

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An X-ray measurement method for simultaneous determination of moisture- and ash content, and heating value has been demonstrated at a Norwegian sawmill on a mixture of spruce bark and dry chips. The method is based on combining X-ray transmission imaging and X-ray fluorescence spectroscopy. Bark is normally used to fuel the heat production within the sawmill together with varied portions of chips and/or sawdust. In our study, we use a mix of wet bark and dry chips to increase the overall net heating value of the mix to ensure a stable combustion process. As the biofuel material is usually stored outside without any cover, the moisture content will vary with weather conditions throughout the year. Efficient utilization of the biofuel material to achieve a stable combustion process requires rapid determination of the biofuel moisture content, which is the single most important process parameter of the feed-in material. The method performance has previously been demonstrated with good agreement on other biofuel assortments, but is in this study calibrated for a new mixture of biomass material. The volume of measured samples was approximately 3 litres, with a total analysis time of one minute per sample. By using rapid and accurate X-ray determination of the moisture content, the project aimed to improve the combustion process to ensure more efficient energy use, lower flue gas emissions, and lower maintenance costs at the selected biomass combustion plant. The obtained results from the X-ray measurements showed a good agreement compared to the reference method.

Clear image acquisition: moving board tracking for surface defects identification

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Surface quality testing which helps to eliminate the products that contain surface defects is important in wood-based panel production to guarantee the resource efficiency. However, in most industries, such step still depended on manual inspection which is proven to be not efficient enough. In this study, a computer vision based testing system was proposed. To remove the image blur caused by fast moving of the boards on production line, the system used a cam mechanism to drive the camera moving along with the board during exposure time. To examine the tracking performance of the system, the experiment was carried out based on a laboratory scale platform. The result showed that, in each motion period of the cam, the camera velocity would reach board velocity for a certain time which could be used for shooting. Meanwhile, the board could be tracked at any velocity by controlling the cam rotation. The increase in uniform motion angle of the cam would increase the time used for exposure as well as the stability of the mechanism. The images were collected on-line at different board velocities, and it was shown that the board in image was clear while surroundings contained some blurs. Moreover, the blurring length of the image was calculated. It was found that the blurring length was limited to 3 pixels at velocity ranging from 200 to 800 mm/s, which made the image quality high enough for defects identification.