# GENETIC IMPROVEMENT OF EUCALYPTES FOR THE DEVELOPMENT OF CULTIVARS INTENDED FOR MULTIPLE WOOD USES AND POPULATIONS WITH THE POTENTIAL TO OVERCOME POSSIBLE ADVERSITIES CAUSED BY CLIMATE CHANGE

Paulo Eduardo Telles dos Santos[1]; Estefano Paludzyszyn Filho[1]; Guilherme Schnell e Schuhli[1]; Isabel Rodrigues Gerhardt[2]; Visêldo Ribeiro de Oliveira[3]

1 Empresa Brasileira de Pesquisa Agropecuária – Florestas. 2 Empresa Brasileira de Pesquisa Agropecuária – Informática Agropecuária. 3 Empresa Brasileira de Pesquisa Agropecuária – Semiárido

The global trend of gradually replacing fossil energy sources with fuels from biomass benefits Brazil enormously, expanding the need to increase the area of forest plantations and promoting the strengthening of partnerships with specific segments of the private sector for the development of products that are appropriate to clonal forestry. Currently, there is a lack of genetic material that is adapted to face the natural edaphoclimatic limitations in certain regions under the concept of forest plantations that serve multiple uses, especially in a scenario aggravated by climate change.

The objective of the project was to expand opportunities for field experimentation, improvement in multi-environments and product validation, contributing so that the territorial expansion of eucalyptus plantations, even under possible effects of global climate change, may take place in the future and be less subject to the risk of compromised production.

The project brought together actions from the Eucalyptus Genetic Improvement Program (PMGE) to launch products prepared for planting in rural properties in the country, with the raw material produced being applied for multiple uses, with emphasis on energy and wood solids (Figure 1). Emphasis was placed on obtaining wood for sawn products and energy, considering not only traditional production systems, but also silvopastoral and agroforestry systems. Using practical processes to produce hybrid experimental seeds by open pollination, the improvement of techniques for the early selection of technological characteristics of wood, the application of controlled pollination in a pot crossing orchard and genetic prospection and transformation studies make up a set of innovative actions presented in the technical content of this project.

The project aimed to meet the demands of man-made forest plantations and demands for the production of material from forest origin, mainly on small and medium sized rural properties, established in different and diverse Brazilian regions.

- In order to understand the thermal, water and biotic stresses that affect the productivity of wood from notably clonal genotypes, the specific objective of the project was to identify genotypes that are tolerant to the environmental stresses mentioned;
- Predominantly conventional forest production systems were used, through experimental/ technological reference units established in seminal and clonal form, and developed actions in the Atlantic Forest, Cerrado, Caatinga and Amazon biomes;
- As a methodology, the experimental field modules were systematically monitored through assessments on survival, wood production and the direct and indirect effects on trees caused by different stresses, evaluating their nature and intensity;
- The project seeks to contribute to climate change adaptation through identifying and using genotypes with adaptive responses consistent with desired silvicultural performances, that have greater capacity for survival under observed conditions, reflected by the productivity of wood;
- The target audience, in general, was represented by forest nurseries, rural farmers and wood consumers;
- The budget allocated to R&D was provided by Embrapa from direct and indirect resources contributed through partnerships with seedling producers, forest-based companies, cooperatives and mining companies.

Acronyms of the species:

PEL: *Eucalyptus pellita;* URO: *Eucalyptus urophylla;* CLO: *Eucalyptus cloeziana;* GRA: *Eucalyptus grandis; ADB: Eucalyptus badjensis;* VIM: *Eucalyptus viminalis;* BEN:

*Eucalyptusbenthamii;* CRE: *Eucalyptuscrebra;* TOR: *Corymbia torelliana; and* MAC: *Corymbia maculata.*

## RESULTS

- Pre-commercial eucalyptus, clonal and seed cultivars, adapted to current edaphoclimatic conditions and climate change scenarios;
- Development of BRS 362, BRS 363, BRS 364 Porteira, BRS QUARENTA and BRSCI 9601 Expoente cultivars;
- PEL clones for use per se and as parental clones in potential crosses for Central Brazil;
- Implementation of long-term strategies to explore PEL, URO, CLO, GRA, TOR, MAC and CRE variability in order to obtain new clones;
- Management of BAD, VIM and BEN experiments for seed production and definition of matrices for continuity of the breeding program;
- Genetic transformation protocol via Agrobacterium tumefaciens for eucalyptus clones and insertion of a gene that confers tolerance to water stress; and
- Database structuring.

## NEXT STEPS AND RECOMMENDATIONS

- Producing propagating material from the cultivars generated available to the productive sector; and
- Empowering Embrapa's participation in forestry agribusiness, contributing to generate jobs and income for this sector.

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**Continued in Annex**

## DATA PUBLISHED IN:

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## PROJECT COORDINATORS

**Dr. Paulo Eduardo Telles dos Santos**

Empresa Brasileira de Pesquisa Agropecuária – Florestas

e-mail: paulo.telles@embrapa.br

**Dr. Estefano Paludzyszyn Filho**

Empresa Brasileira de Pesquisa Agropecuária – Florestas

e-mail: estefano.filho@embrapa.br

**Dr. Guilherme Schnell E Schuhli**

Empresa Brasileira de Pesquisa Agropecuária – Florestas

e-mail: guilherme.schuhli@embrapa.br

**Dra. Isabel Rodrigues Gerhardt**

Empresa Brasileira de Pesquisa Agropecuária – Informática Agropecuária

e-mail: isabel.gerhardt@embrapa.br

**Figure 1:** Performance evaluation experiment of wild Eucalyptuscrebra imported from Australia, installed at Embrapa – Semiárido (Petrolina-PE), demonstrating the high tolerance of germplasm to the accentuated water and thermal stresses in the semi-arid region of northeastern Brazil and also the high potential for improving the species for the production of wood. Age ≥ 5 years Average height: around 10 meters..

*Crédit: Visêldo Ribeiro de Oliveira.*