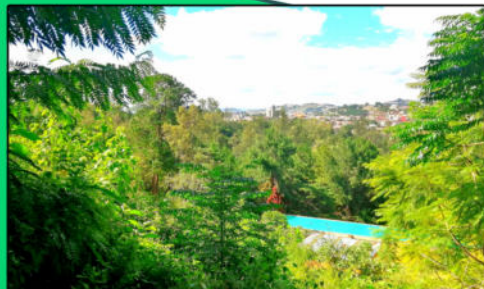


UNIVERSITY TREE CONSERVANCY

Botanical Garden



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Panoramic view of a lush forest section in the Botanical garden of the University of Ankatso

Preservation of Madagascar's Precious Trees

Madagascar, this island renowned for its incredible biodiversity, has unfortunately lost nearly 44% of its forests over the past 60 years, according to the International Union for Conservation of Nature (IUCN). Among these unique forests in the world are precious tree species such as *Dalbergia* (rosewood) and *Diospyros* (ebony), which today are endangered due to massive deforestation caused by illegal exploitation, fires, and the production of charcoal for cooking.

Faced with this unprecedented loss, a preservation project was born at the botanical garden of the University of Antananarivo in Ankatso, aiming to conserve these unique plant species through innovative propagation techniques. At the heart of the Department of Plant Biology of the Faculty of Sciences, this botanical garden has taken on the mission of protecting and regenerating endangered precious tree species.

Rosewood and Ebony

Among the rich diversity of tree species in Madagascar, the *Dalbergia* and *Diospyros* genera are of particular importance. The *Dalbergia*, commonly called rosewood, as well as the *Diospyros*, known as ebony wood, are rare and precious essences, highly coveted for their exceptional wood. Their natural beauty and remarkable qualities make them choice materials for making musical instruments, fine furniture and art objects. Unfortunately, illegal overexploitation, devastating fires and intensive charcoal production have led to an alarming depletion of these trees in their natural habitats.

Their very survival is now gravely threatened by rampant deforestation. Faced with this unprecedented ecological crisis, the botanical teams of the Ankatso garden are determinedly working to reverse this trend by implementing innovative cloning programs. Their primary objective is to sustainably regenerate these unique species so that they can once again thrive, thus ensuring the perpetuation of an inestimable natural heritage for future generations



Green rosewood



Green ebony
(*diospyros baronii*)

ADVANCED TREE CLONING

Air layering: A key conservation method?

air layering, an asexual vegetative propagation technique, is a key method used in the botanical garden to ensure the conservation of precious species. This ingenious approach allows faithful reproduction of a mother plant without resorting to seedlings, thus ensuring that the new generation is genetically identical and inherits the desirable characteristics.

In contrast to terrestrial layering practiced on buried stems, air layering is carried out on branches exposed to open air.

This method offers a remarkably high success rate, proving particularly valuable for the multiplication of species that are difficult to reproduce by germination or have slow growth rates, such as the coveted rosewoods and ebonies.



Wrapping around the air layering zone of a rosewood branch

The process begins with the careful selection of a healthy and vigorous branch on the mother plant. A portion of the bark is then carefully removed to create an area conducive to rooting. This denuded zone is wrapped in a moist substrate, often composed of sphagnum moss or wood shavings, the whole being covered with a plastic film to maintain the necessary humidity. After a few months of patience, roots emerge from this area, allowing the new shoot, now an autonomous layer, to be gently separated and nurtured until fully mature



Air layering on a rosewood's branch, highlighted in blue



Rosewood air-layered cutting thriving independently from its parent plant

THE UNIVERSITY OF ANTANANARIVO SAFE HAVEN FOR PRECIOUS TREE SPECIES

At the heart of the University of Antananarivo, on the Ankatso campus, a devoted team of botanists is waging a fierce battle to safeguard the precious essences of trees unique to the world that Madagascar harbors, threatened with extinction. Their weapon? Remarkably ingenious plant cloning techniques such as air layering and cutting propagation. Thanks to these methods, they manage to faithfully regenerate these rare species, identically reproducing their invaluable genetic characteristics. Each new shoot thus represents a victory against the dramatic loss of this exceptional biodiversity.





A BIOLOGY TEAM DEDICATED TO TREE CONSERVATION

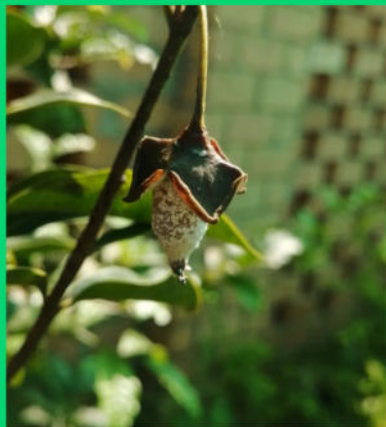
Driven by an unwavering passion, these seasoned scientists combine rigor, expertise, and dedication to multiply coveted essences such as rosewood and ebony from mother plants on the brink of extinction. Under the expert direction of Dr. Aro Vonjy, and in partnership with the Jacquelyn Jestine Sanders Foundation chaired by Kenneth Coman, they have implemented innovative projects for the sustainable management of the campus' wastewater, allowing it to be recycled for irrigating the greenhouses and botanical plots.

By perpetuating these unique plant wonders, the team from the University of Antananarivo is passing on a precious legacy to future generations, kindling hope for the rich Malagasy biodiversity to be reborn in all its splendor. Their enlightened devotion illustrates the path towards harmonious coexistence between Humans and Nature on this island of exceptional natural treasures.

ADVANCED TREE CLONING

Propagating through Cuttings

In addition to air layering, taking cuttings is another asexual vegetative propagation technique frequently employed at the botanical garden as part of efforts to conserve precious plant species. This skillful method involves taking a living part, such as a stem, branch or leaf, from a mother plant, and rooting it to generate a new genetically identical individual.



A flourishing ebony cutting displaying its health and vigorous growth, showcasing the effectiveness of propagation through cuttings.

Taking cuttings is particularly suitable for regenerating woody species such as rosewoods and ebonies, thus offering a promising way to ensure their perpetuation. The meticulous process begins with a rigorous selection of the segments to be cut, favoring vigorous semi-woody or herbaceous shoots with healthy buds. These cuttings are then carefully trimmed, keeping only an optimal number of leaves, before being dipped in a hormone solution that stimulates root formation.

Once prepared, the cuttings are delicately planted in a light, moist and well-drained substrate, generally composed of a carefully dosed mixture of peat and sand.

The top portion of the cutting without roots is separated and transferred to be placed under a greenhouse, a confined environment where humidity conducive to rooting prevails. Regular but measured watering is essential during this critical phase, which can last for several weeks.

When the young shoots are firmly rooted, they can finally be individually repotted, thus beginning a new stage of their development towards maturity.



Young cutting of an ebony tree (*Diospyros pervilleana*)

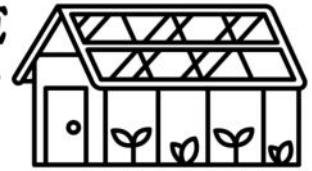


Cuttings undergoing root development phase, cultivated in a shaded plot to promote optimal growth conditions



THE GREENHOUSE

The Magic of Greenhouses for Regenerating Rare Plants



The strategic utilization of greenhouses plays a pivotal role in the success of cutting and air layering techniques employed at the botanical garden. These ingenious structures, veritable plant incubators, facilitate the recreation of an optimal microclimate, ideally suited for promoting root development and the establishment of cuttings and air-layers derived from sometimes delicate species.



Air-layers and cuttings undergoing critical rooting phase, meticulously cultivated in the confined greenhouse environment for precise control of humidity and temperature levels. Recording of 38°C at 2:27 PM inside during the visit on March 14, 2024.



Misting irrigation system for cuttings and air layers

The greenhouse aimed at the botanical garden comprises a transparent plastic enclosure located outdoors. Its main advantage lies in its ability to maintain high and consistent humidity levels around the developing plants. This moderate humidity prevents detrimental desiccation of the tender shoots during the critical rooting phase. A misting or fog irrigation system provides precise and uniform irrigation, essential for the cuttings without disturbing the delicate rooting substrate. The water is finely atomized into minute droplets, mimicking a natural drizzle, in order to delicately moisten the substrate and shoots without damaging them.

Beyond regulated humidity, mini-greenhouses also engender a gentle greenhouse effect by trapping thermal energy, thereby maintaining temperatures slightly elevated relative to the external environment. This privileged microhabitat actively stimulates growth of cuttings and air-layers, particularly those originating from tropical species such as precious woods. Regular monitoring and adjustments of aeration, shading, and irrigation are imperative to preclude the proliferation of undesirable molds, while concomitantly providing optimal conditions conducive to the emergence of this nascent plant life.



New greenhouse under construction

