

Promoting a Constructed Wetlands Project at the University of Antananarivo, Madagascar

The Garden of Eden



Introduction

The University of Antananarivo, nestled in the vibrant capital city of Madagascar, is home to acres of lush rice fields. These fields, which receive abundant stormwater from the expansive 50-hectare university grounds, present a unique opportunity to transform the campus and address critical infrastructure challenges.

By converting these rice fields into constructed wetlands, the university could create a stunning ecological feature that not only enhances the local environment but also provides a sustainable solution to water scarcity. This ambitious "Garden of Eden" project holds the potential to make the university a beacon of ecological innovation and a magnet for eco-tourism.

Fruit Tree Shaded Lagoon Storage & Biological Water Treatment



Solution

Vision for the Constructed Wetlands

The concept of transforming the rice research fields into constructed wetlands involves designing a series of interconnected water bodies that mimic natural wetland ecosystems. These wetlands would serve multiple purposes:



[Drinking] Water Management and Storage: Constructed wetlands can effectively capture and store stormwater, reducing the risk of flooding and ensuring a steady supply of water throughout the year. This is particularly crucial for the university, which currently struggles with water infrastructure challenges.

Biodiversity and Habitat Creation: Wetlands are known for their rich biodiversity. By creating these ecosystems, the university would support a variety of plant and animal species, contributing to conservation efforts and enhancing the local environment.

Educational and Research Opportunities: The constructed wetlands would serve as a living laboratory for students and researchers, providing hands-on learning experiences in ecology, environmental science, and sustainable water management.

Aesthetic and Recreational Value: A beautifully designed wetland area would offer serene landscapes for relaxation and recreation, enhancing the campus's appeal to students, staff, and visitors.

The Garden of Eden Solution

Addressing Water Infrastructure Challenges

One of the most pressing issues facing the University of Antananarivo is the lack of reliable water infrastructure. Students and staff often face water shortages, which can disrupt daily activities and academic work. The "Garden of Eden" project aims to tackle this problem head-on by:

Rainwater Harvesting: The constructed wetlands would act as a massive rainwater harvesting system, capturing runoff from the university grounds and storing it for future use.

Groundwater Recharge: By facilitating the infiltration of stormwater into the ground, the wetlands would help recharge local aquifers, improving the overall water availability in the region.

Water Quality Improvement: Wetlands are natural filters, capable of removing pollutants from water through physical, chemical, and biological processes. This means that the water stored in the wetlands would be cleaner and safer for use.



**Southern Side
Rice Permaculture
Research Fields**



Image © 2024
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Data SIO, NOAA, U.S. Na

Constructed Wetlands for Stormwater Management

Academic Research and Foundation Support

In 2024, the Jacquelyn Jestine Sanders Foundation generously funded a pivotal academic research initiative at the University of Antananarivo.

This research, encapsulated in the Sustainable Vision Academic Journal, has provided a comprehensive analysis of the university's water infrastructure challenges. The findings from this study have led to the development of the "Garden of Eden" proposal as the optimal solution.

The research highlighted the critical need for innovative water management strategies to address the university's ongoing water shortages. The proposed constructed wetlands emerged as a core component of this solution, offering a multifaceted approach to sustainable water management. This project represents the heart of the proposed water management strategy, promising to transform the university into a water-rich, ecologically vibrant campus.



Wastewater Treatment Zone

Northern Side Rice Permaculture Research Fields

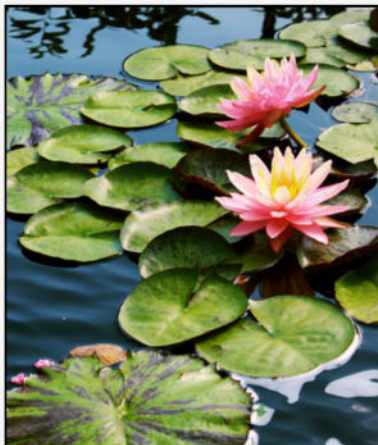
This would be the largest Constructed Agroforestry Wetlands Project in Africa ... making the University of Antananarivo a Leading Research Facility for Permaculture and Water Management. Building Prosperity via Natural Solutions.

Predicted Flora

Madagascar is renowned for its unique and diverse ecosystems, home to many species found nowhere else on Earth. By converting the rice research fields at the University of Antananarivo into constructed wetlands, this "Garden of Eden" project could attract a vibrant range of plant and animal species, enhancing biodiversity and ecological value. Here's a prediction of the flora and fauna that might flourish in this new wetland habitat.

Aquatic Plants:

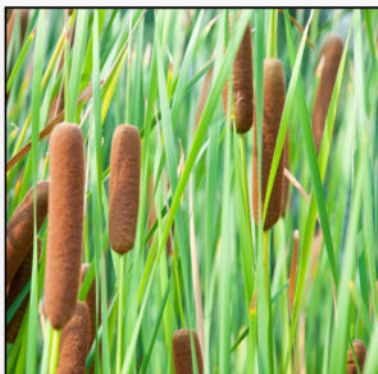
- **Water Lilies (Nymphaeaceae):** Known for their beautiful, floating flowers, these plants will thrive in the still waters of the constructed wetlands.
- **Papyrus (Cyperus papyrus):** Common in wetland areas, this plant can create dense, green stands that provide habitat and protection for wildlife.
- **Duckweed (Lemna spp.):** Small, floating plants that can quickly cover the surface of the water, providing food for various aquatic creatures.



Water Lilies / Photo Credit: Canva Pro Stock

Emergent Vegetation:

- **Cattails (Typha spp.):** These tall plants with distinctive brown flower spikes will establish along the water's edge, helping with filtration and erosion control.
- **Bulrushes (Schoenoplectus spp.):** Found in shallow water, these plants offer nesting material and shelter for birds and other wildlife.



Cattails / Photo Credit: Canva Pro Stock

Wetland Trees and Shrubs:

- **Willows (Salix spp.):** These trees thrive in wet conditions and can help stabilize the soil along the wetland margins.



Duckweed / Photo Credit: Canva Pro Stock



Papyrus / Photo Credit: Canva Pro Stock

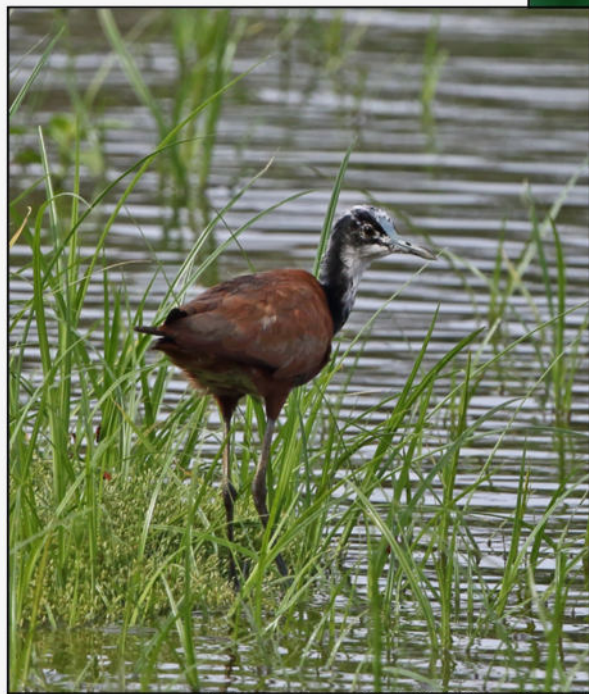
and Fauna for the "Garden of Eden" Wetlands

Birds:

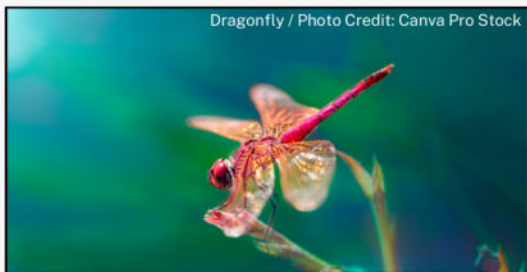
- Madagascar Pond Heron (*Ardeola idae*): An endangered species that could find a new habitat in the wetlands, benefiting from the abundant food supply.
- Madagascar Jacana (*Actophilornis albinucha*): These birds, with their striking appearance, would thrive in the wetland environment.
- Kingfishers (*Alcedinidae*): Various kingfisher species would be attracted to the wetland for hunting fish and insects.

Amphibians and Reptiles:

- Tomato Frog (*Dyscophus antongilii*): This brightly colored frog species is native to Madagascar and would find the wetlands a suitable habitat.
- Madagascar Tree Boa (*Sanzinia madagascariensis*): These boas could inhabit the riparian zones, preying on small mammals and birds.



Madagascar Jacana / Photo Credit: Canva Pro Stock



Dragonfly / Photo Credit: Canva Pro Stock

Invertebrates:

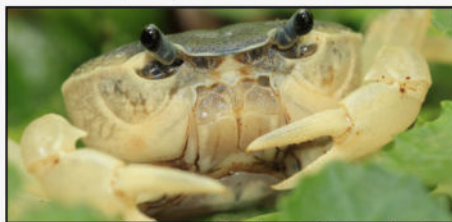
- Dragonflies and Damselflies (*Odonata*): These insects are vital indicators of a healthy wetland ecosystem and would flourish in the new habitat.
- Butterflies (*Lepidoptera*): Species such as the Madagascar Giant Swallowtail (*Papilio antenor*) would be attracted to the diverse plant life.



Tomato Frog / Photo Credit: Canva Pro Stock

Fish and Aquatic Species:

- Cichlids (*Cichlidae*): Diverse species of cichlids, native to Madagascar's waters, could inhabit the constructed wetlands, contributing to the aquatic biodiversity.
- Freshwater Crabs (*Potamonautidae*): These crabs play a crucial role in the wetland ecosystem, helping to decompose plant material.



Freshwater Crab / Photo Credit: Canva Pro Stock

Wetlands Agroforestry Research Center

Antananarivo Leading Africa in Rice Permaculture

Ecotourism Potential

The "Garden of Eden" project is not only about solving water problems; it also has the potential to position the University of Antananarivo as a prime research and ecotourism destination. Madagascar is already renowned for its unique biodiversity and natural beauty, attracting tourists from around the world. By creating an exemplary ecological feature within the capital city, the university can:

- **Attract Visitors:** The constructed wetlands, with their diverse flora and fauna, could become a major attraction for eco-tourists, nature enthusiasts, and researchers.
- **Boost Local Economy:** Increased tourism would bring economic benefits to the local community, creating job opportunities and supporting local businesses.
- **Promote Environmental Awareness:** The project would serve as a model for sustainable development, inspiring visitors and local residents to engage in conservation efforts and adopt eco-friendly practices.

Research Team at the University gets modern Rice Permaculture Research Facility.

WIN

The University Community gains access to clean drinking water all year long - without reliance on JIRAMA.

WIN

The University becomes a Research and thought leader in Africa.

WIN



Wetlands Agroforestry Research Center, Antananarivo. Photo Credit: Coman/OpenArt.ai



Wetlands Agroforestry Research Center, Antananarivo. Photo Credit: Coman/OpenArt.ai

Madagascar is renowned for its extraordinary biodiversity, with a high percentage of flora and fauna that are found nowhere else on Earth. A wetlands agroforestry agricultural research center would highlight the island's unique ecosystems and offer visitors a chance to observe rare species in their natural habitat. This center would serve as a living museum of biodiversity, attracting ecotourists keen to experience Madagascar's rich natural heritage.

Educational Opportunities

The research center could offer guided tours, workshops, and educational programs that engage visitors in hands-on learning experiences. These programs could cover topics such as wetland restoration, agroforestry techniques, and sustainable farming practices. By integrating education with tourism, the center would foster a deeper understanding and appreciation of ecological and agricultural research among tourists.

Community Engagement

Such a center would likely involve local communities in its operations, providing them with employment opportunities and involving them in conservation and research activities. This engagement would enhance the ecotourism experience by allowing visitors to interact with local people and learn about their culture, traditions, and sustainable living practices. This kind of community-based tourism can help uplift local economies and ensure that the benefits of tourism are shared widely.

Benefits for Other Universities and Agricultural Research Centers - Collaborative Research

Involving other universities and agricultural research centers in this project would foster collaborative research and knowledge exchange. Institutions could share expertise, resources, and data, leading to more robust research outcomes and innovations in sustainable agriculture and conservation.



Wetlands Agroforestry Research Center, Antananarivo.

Photo Credit: Coman/OpenArt.ai

Global Impact

The involvement of multiple institutions could elevate the project's profile, attracting international attention and funding. This global collaboration could lead to the development of best practices that can be applied in other parts of the world, enhancing the global impact of the research conducted at the center.

Enhanced Research Outputs

By collaborating with a diverse group of researchers, the center could produce comprehensive and interdisciplinary research outputs. These publications could address a wide range of topics, from ecological restoration and biodiversity conservation to sustainable agriculture and climate resilience, contributing significantly to the scientific community.

In summary, a wetlands agroforestry agricultural research center in Madagascar would not only serve as an excellent ecotourism destination but also provide substantial benefits through collaborative research, educational opportunities, and community engagement. By involving other universities and research centers, the project could achieve a broader impact, fostering global solutions to environmental and agricultural challenges.

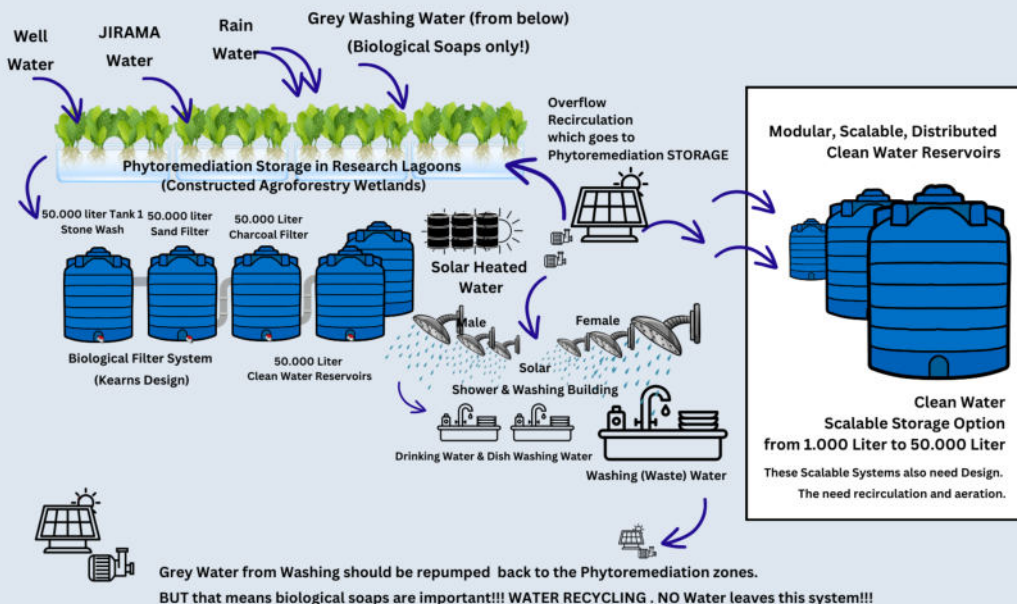
Constructed Wetlands as part of the Central Water Infrastructure

The proposal to incorporate constructed wetlands as a central element of the university's water infrastructure marks a significant advancement in sustainable water management. The primary objective is to establish an extensive water storage system capable of effectively managing stormwater, which currently is not being utilized to its full potential. The plan involves directing stormwater into the university's Research Facility Lagoons, which have been engineered to accommodate up to 10 million liters of water. Preliminary assessments suggest that these lagoons could potentially store as much as 25 million liters, far exceeding the university's current water demand.

To maximize the utility of this stored water, the project aims to develop 100 defined research pads. These pads are designed for easy access and optimal testing conditions, providing a controlled environment for various research activities. By slowing down and storing stormwater, the constructed wetlands will not only enhance water conservation efforts but also support diverse research opportunities within the university, thereby aligning with both environmental sustainability and academic excellence.

This initiative not only addresses the immediate need for improved stormwater management but also sets a precedent for innovative water conservation practices in academic institutions. The integration of such a large-scale water storage system within the university's infrastructure highlights a commitment to sustainable development and resource efficiency, potentially serving as a model for other universities and organizations aiming to enhance their environmental stewardship.

Central Water Infrastructure in Technical Planning by the JJSF Fellowship



Constructed Wetlands: returning to the Garden of Eden to address Water Needs

Conclusion

The "Garden of Eden" project at the University of Antananarivo represents a visionary approach to addressing water infrastructure challenges while enhancing the ecological and aesthetic value of the campus. By converting the rice research fields into constructed wetlands research facility, the university can create a sustainable water management system, support biodiversity, and attract ecotourism. This initiative, backed by the Jacquelyn Jestine Sanders Foundation and grounded in rigorous academic research, has the potential to transform the university into a leading example of ecological innovation and sustainability. It is an opportunity to create a lasting legacy that combines environmental stewardship with practical solutions, truly embodying the spirit of a modern-day Garden of Eden.



Lagoons at the University of Antananarivo / Photo Credit: FINARCH



Rice Research at the University of Antananarivo / Photo Credit: FINARCH



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Sustainable Vision Journal Editor

