Tree-based restoration of the Floristic and Genetic Diversity of Tropical Dry Forest (TDF)

**Background**
In South America, 60% of the original TDF ecosystem coverage has disappeared and in Colombia only 8% of its original cover stands. Remaining forest patches are very fragmented, immersed in landscapes dominated by crops and pasture. Ecosystem restoration is considered a global priority to contribute to biodiversity conservation, climate change mitigation and adaptation, and to combat desertification. To ensure the success of restoration initiatives requirements must focus on the choice and combination of tree species and the genetic quality of the germplasm used.

**Objective**
Our goal is to develop best practices and successful protocols for tree-based ecological restoration of TDF in Colombia taking into account genetic considerations, species functional traits and expected impacts of climate change. Since protocols will be developed using secondary data and geospatial and ecological modeling techniques, they will be validated by field studies and experiments at sites across the country, with a strong focus on the compensation area for biodiversity loss caused by the construction of the largest water dam in Colombia, the hydroelectric of Ituango.

**Expected outputs**

**INTERACTIVE MAP TO GUIDE RESTORATION ACTIVITIES OF TROPICAL DRY FOREST**

- **COLOMBIA**
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  - **Potential areas for restoration**
  - **Base map: Current distribution TDF + potential areas for TDF restoration**
  - **What is the most appropriate combination of seed sources for each of the species, ensuring site adaptability and genetic diversity of planting material?**
  - **Recommendations on best practices to collect seeds**

**DIVERSITY NODES safeguarding original tree diversity**

- **The Dry Tropical Forest that will be flooded in Ituango**
- **The compensation area for biodiversity loss**
- **The prioritized species for restoration (5-10ea)**
- **Diversity nodes at strategic sites in restoration areas capturing diversity of original forests**
- **Restoration of compensation area**

**Main Activities**

- **Expert network**
  - Facilitate networking of experts in tropical dry forest to inform the project, validate prioritizations and methodologies and disseminate outputs

- **Baseline and species prioritization**
  - Collection of geographical, ecological, biological and socioeconomic data
  - Species prioritization using available knowledge on genetics, functional traits (particularly related to site adaptability and carbon sequestration capacity) and socioeconomic considerations

- **Distribution modeling**
  - Model potential distribution of all tree species by means of ensemble modeling, under present and future climate conditions

- **Genetic diversity and Restoration designs**
  - Characterize and map the genetic diversity of 5-10 prioritized species in representative set of relic forests of TDF
  - Decision trees for site-specific selection of most appropriate seed sources, based on climate modeling and genetic data
  - Protocols for sexual and asexual propagation of prioritized species
  - Provenance trials to assess site adaptability of planting material
  - Test risk of outcrossing depression through controlled pollination and progeny trials

- **Conservation and Monitoring**
  - Safeguard genetic and floristic diversity through establishment of diversity nodes
  - Protocols for future monitoring

**Study Area**

- **Restoration protocols**: potential areas of TDF in Colombia
- **Case study**: Ituango, Antioquia

**Expected outcomes**

- EPM, the dam builder and co-sponsor of the project will use the protocols to restore 13,000 ha of TDF
- Forestpa will use the protocols in future restoration projects
- Alexander von Humboldt Institute will facilitate integration of protocols in national legislation
- Universidad Nacional will integrate the knowledge in forestry curricula
- Expert network facilitates uptake of the protocols by stakeholders