BAMBOO PLANTATION FOR REFORESTATION, LAND RESTORATION AND CHARCOAL PRODUCTION IN MADAGASCAR
MADAGASCAR PRESENTATION AND CHALLENGES

587 000 km²
1580 km long - 580 large

29,61 M
inhabitants in 2022
(World Bank)

3,98 children
per woman in 2018
(World Bank)

80.7%
poverty rate in 2023
(World Bank)
CAUSE OF DEFORESTATION AND CONSEQUENCES

- 200,000 hectares of forests disappear each year in Madagascar due to bush fires and charcoal production.

- 22 million m3 of wood are used each year by 82% of Malagasy households, who still use wood or charcoal as fuel for cooking.

- The primary forests of Madagascar, which covered more than 30% of the territory in 1950, only cover 10% today.
ENDEMIC BAMBOO SPECIES IN MADAGASCAR

• **32 species of bamboo endemic to Madagascar** which grow mainly along the central massifs and in the humid forests of the island.

• **In these regions with high rainfall**, bamboo has been used for centuries for different uses: housing, crafts, energy source, etc.

• But most of the **bamboo endemic species** are quite small and thin and have **low added value**.
OUR SOLUTION: HIGH BIOMASS BAMBOO SPECIES

- We use **15 different bamboo varieties** for our plantations, selected for their high biomass yield.

- Most of them are **varieties of Dendrocalamus and Bambusa**, species which are native to South-East Asia which grow “in dense clumps” with a so-called sympodial rhizome.

- These varieties **are not invasive** and represent no threat of hybridization with the endemic bamboo species of Madagascar.
THE BAMBOO VARIETIES WE PLANT IN THE DIFFERENT ECOREGIONS OF MADAGASCAR

<table>
<thead>
<tr>
<th>Bamboo varieties</th>
<th>Lowland forest</th>
<th>Subhumid forest</th>
<th>Dry deciduous forest</th>
<th>Succulent woodlands</th>
<th>Spinny Thicket</th>
<th>Mangroves</th>
<th>seedlings to plant per hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bambusa bambos</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td></td>
<td>+</td>
<td></td>
<td>350</td>
</tr>
<tr>
<td>Bambusa balcoa</td>
<td>+++</td>
<td>+++</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>350</td>
</tr>
<tr>
<td>Bambusa polymorpha</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Bambusa tulda</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Bambusa vulgaris</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Cephalostachyum pergracile</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Dendrocalamus asper</td>
<td>+++</td>
<td>+++</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>Dendrocalamus giganteus</td>
<td>+++</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>Dendrocalamus manihotaceus</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Dendrocalamus strictus</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Gigantochloa pseudocarundinacea</td>
<td>+++</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>Oxthaxanthera abyssinica</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Thysostachys Oliveri</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Pseudastrapogon Stockalii</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>400</td>
</tr>
</tbody>
</table>

Map of terrestrial ecoregions of Madagascar
From the study: “Primates as Predictors of Mammal Community Diversity in the Forest Ecosystems of Madagascar”
HOW WE PRODUCE BAMBOO PLANTS

- **From seeds imported from India or China:** Germination yield is uncertain because bamboo seeds have the ability to germinate for only a few weeks.

- **By cuttings:** Requires already having young or mature bamboo plants

- **By rhizome splitting:** Has the ability to propagate young bamboo plants obtained from germinating seeds or mature bamboo plants.

- **By tissue culture:** Technical process requiring a precise level of humidity and temperature. Can produce bamboo plants in large quantities.
BAMBOO YIELD

4 to 5 Years
to get mature after planting

1/3 of the poles
can be harvested every
year as bamboos have an
annual regrowth

4 Tones
of biomass per ha/year in
natural bamboo forest

15 to 40 Tones
of biomass per ha/year in
managed plantation
BAMBOO VS EUCALYPTUS YIELD

- Eucalyptus takes **10 years** to be mature for logging at one time.
- Bamboo yield is based on **20 tonnes** per ha/year, which is the low production figure.

**Yield 10 years after planting**
- Eucalyptus: 80 tonnes
- Bamboo: 100 tonnes

**Yield 20 years after planting**
- Eucalyptus: 100 tonnes
- Bamboo: 300 tonnes
BAMBOO CHARCOAL PRODUCTION

- The calorific value of **bamboo charcoal** is approximately 30.5 MJ/kg. It's a very **efficient fuel for cooking as it produces intense, long-lasting heat**.

- It takes **24h to 48h to carbonize** dry bamboo pieces in brick kiln specially made for.

- The **ratio of carbonization is between 20 % to 30%** depending on the bamboo varieties.

- Unlike wood charcoal, **bamboo charcoal does not emit smoke when burned** and therefore limits lung diseases.
BAMBOO AGAINST SOIL EROSION AND BIODIVERSITY PROTECTION

• **Bamboo rhizome system is useful for preventing soil erosion** when planted along banks and on steep hillsides. Each clump of bamboo can hold on average 6 m³ of soil.

• **Bamboo preserve groundwater** by improving water infiltration, water conservation and protecting wetlands.

• **The bamboo leaves** that fall regularly help to naturally fertilize the soil by forming **natural compost**.

• Animal species such as **Gray Bamboo Lemur feed almost exclusively on young bamboo shoots**.
BAMBOO FOR CARBON OFFSETTING (VCM)

30 to 35 %
more CO2 captation than regular tree forest

96 to 392
tonnes of CO2 absorbed per Ha/year during its growth

30 %
more oxygen produced during its growth than trees

1000 ha
minimum area requested by VCM project developer
WHY BAMBOO HAS BEEN UNDERRATED FOR REFORESTATION AND CHARCOAL PRODUCTION TO AVOID DEFORESTATION?

• Getting a bamboo plant is not as simple as getting a plant tree.

• Lot of misconception about the invasiveness of bamboo, especially in occidental countries with temperate climate.

• Lack of knowledge on the benefits of bamboo, especially for the much higher biomass production compared to trees.

• But things are changing, more projects are developed in several countries in Africa.