Characterization of forest nurseries in the Pacific Northwest

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General data

- Capital = Sucre city (9,000 f.a.s.l.)
- Seat of government = La Paz city (12,000 f.a.s.l.)
- Population = 10.7 millions (65% Natives)
- Area= 425,000 sq./Miles (TX + CA)
Authorities and Government buildings in La Paz city
Bolivian Forests

- Natural forests cover 53 million hectares (130 million acres)
- 300 tree species can be used as timber, fuel, construction wood, pulp and raw material
- This forest is habitat to close to 3,000 vertebrates
Bolivian forests are concentrated in the lowlands, and represent 10% of the Amazon rainforest

- Problem: Illegal logging
- Forest dwellers are working with government authorities to fight illegal logging
- More than 3,500 families make a living of commercializing non timber products
Deforestation rates in Bolivia (2001-2013)

Lowest= 190 Thousand Acres, 2013
Highest= 710 Thousand Acres, 2008

http://www.cfb.org.bo/noticias/ medioambiente/ deforestacion-en-bolivia
Wood classification according to strength and harvest revenue by hectare (2.7 acres)

<table>
<thead>
<tr>
<th>WOOD STRENGTH</th>
<th>Examples of Species</th>
<th>Uses</th>
<th>Revenue (approx.) USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft-wood</td>
<td>• Aniba perutilis</td>
<td>Plywood, veneer, doors, boxes, models, toys, shoe heels</td>
<td>4,100</td>
</tr>
<tr>
<td></td>
<td>• Schizolobium parahyba</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate</td>
<td>• Centrolobium tomentosum</td>
<td>Flooring, ships manufacturing, home construction</td>
<td>30,800</td>
</tr>
<tr>
<td></td>
<td>• Hymenaea courbaril</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard-wood</td>
<td>• Apuleia mollaris</td>
<td>Furniture, ship manufacturing, train tracks</td>
<td>53,500</td>
</tr>
<tr>
<td></td>
<td>• Terminalia oblonga</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

General characterization of forest nurseries in the Pacific Northwest and the application of lessons learned at Carmen Pampa University (La Paz, Bolivia)
GENERAL OBJECTIVE:

Learn about forest nursery management practices and techniques in the Pacific Northwest to apply the lessons to Carmen Pampa University Nursery in Bolivia.

SPECIFIC OBJECTIVES

1. To describe the soil and water management
2. To learn about control and management of plagues and diseases
3. To understand tree-seed management protocols
4. To identify the process of genetic material selection
1. To describe the soil and water management practices

Forest nursery soil-mix components

- Pet soil (organic matter)
- Clay
- Sand
- Others (fertilizer, nutshells...)

[Image: Forest nursery soil-mix components]
Irrigation

In the Pacific Northwest, the nurseries studied shown the use of well water for irrigation:

- The wells are found at depths between 150 and 350 ft.
- Water quality is high (no heavy metals or salts)
- No water treatment needed prior use for irrigation
- Water irrigation regimes vary depending on the species
Fertigation

- Liquid fertilizer is diluted in water and applied through the irrigation system to achieve higher plant growth rates and better plant absorption.
2. To learn about control and management of plagues and diseases

Common disease in seedlings

- **Damping off** is a disease that weakens or kills the seed or seedling and it is caused mostly by fungus like *Fusarium*, *Pythium*, and *Cylindrocarpon*

- Wet and cool soil conditions allow for fungus development
Fungal attack symptoms

- Growth slow down
- Browning of the leaf tips
- Brown spots on leaves
- Drooping of leaves
- Seedling death

Control with Fungicides

- Fungicides can be assimilation by contact or systemically
- Contact fungicides are applied to the leaves
- Systemic fungicides are applied to the soil
Plague example: Aphids

Symptoms
- Leaves start to turn yellow
- Colonies of aphids can be found in small patches

Control
- Biological: Lady bugs
- Plant spray with soapy water (large populations)
- Insecticides might also eliminate beneficial insects, in the nursery, should be used as last resource
3. To understand tree-seed management protocols
4. To identify the process of genetic material selection

- Seed orchard trees are established using a strong root stock grafted to a scion of the desired clone of the same species
- Grafted material comes from a much older tree, allowing the grafted plant to be able to seed much sooner
- Each clone is tagged and tracked throughout its growth in the orchard
- X-ray techniques are used to identify good seeds for root stock
Lesson learned to apply in Carmen Pampa University
- Carmen Pampa University is located 70 miles from La Paz city.
- Altitude is 5,740 (f.a.s.l.).
The university nursery propagates tree and perennial species.
New ideas for test!

- Implement and adapt a water filtration system, prior irrigation
- Set the plant containers above ground
- Develop propagation protocols for tree species of interest
- Test grafting techniques in tropical tree species
- Test seed production stimulation techniques in tropical tree species
- Test different soil mixtures (peat soil, clay, sand)
- Develop seed storage protocols for tropical tree species
How am I going to share these new knowledge?

- Helping students to develop research to test new ideas learned
- Developing outreach programs with new ideas learned for local tree farmers
Thank you!!!

“Quitters never win; and winners never quit” (Vincent Lombardi)