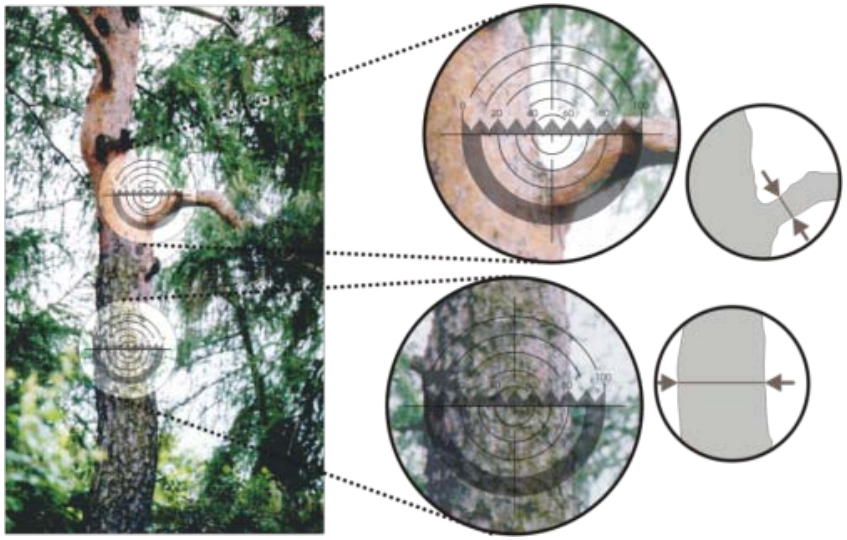
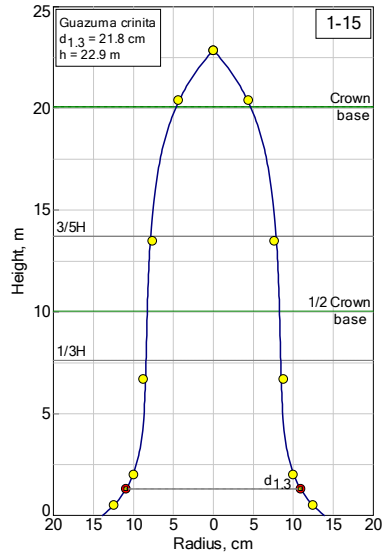
International consortium on the forest investigation and innovation

Permanent Research Plots Network for Peru





Presentation content

1. **International consortium on forest investigation and innovation:**
   - Justification.
   - Partners.
   - Location.
2. **Permanent Research Plots Network (PRPN) project:**
   - Main goals of the PRPN project.
   - Parametrization of the stem profile models for main commercial species.
   - Field-Map role in PRPN project.

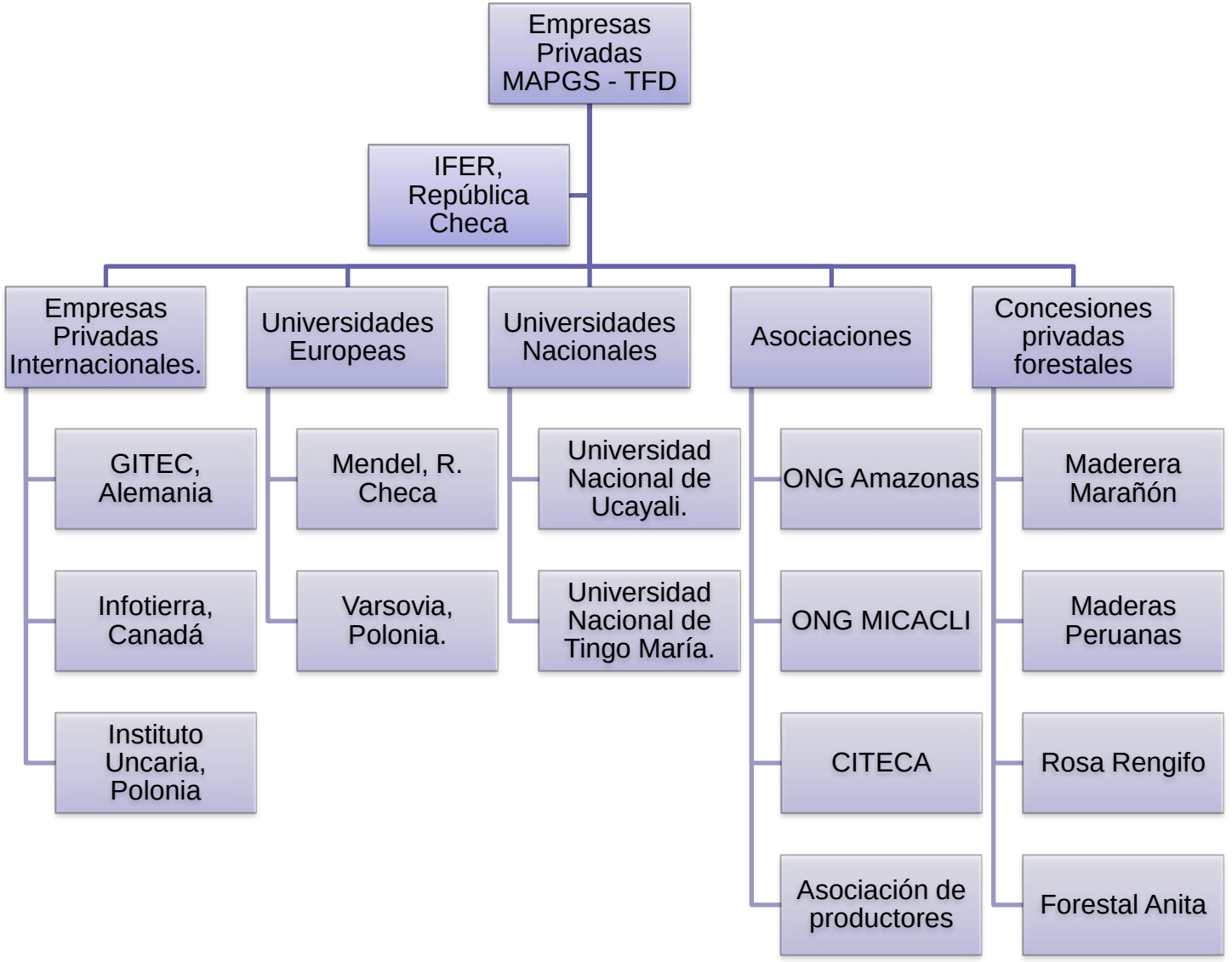
Justification

1. Accessibility and availability of the forest data?
2. Are the current data on existing permanent plots trustful?
3. Available information for research and monitoring?
4. Equations of steam profile or correction factor?
5. Universities with enough scientific and technology capacity?
6. Are the data of forest inventories (National Forest Inventory, Regional Forest Inventories, Forest Concessions) available?
7. Free Trading Agreements (with USA and EU)?
8. Public laws?

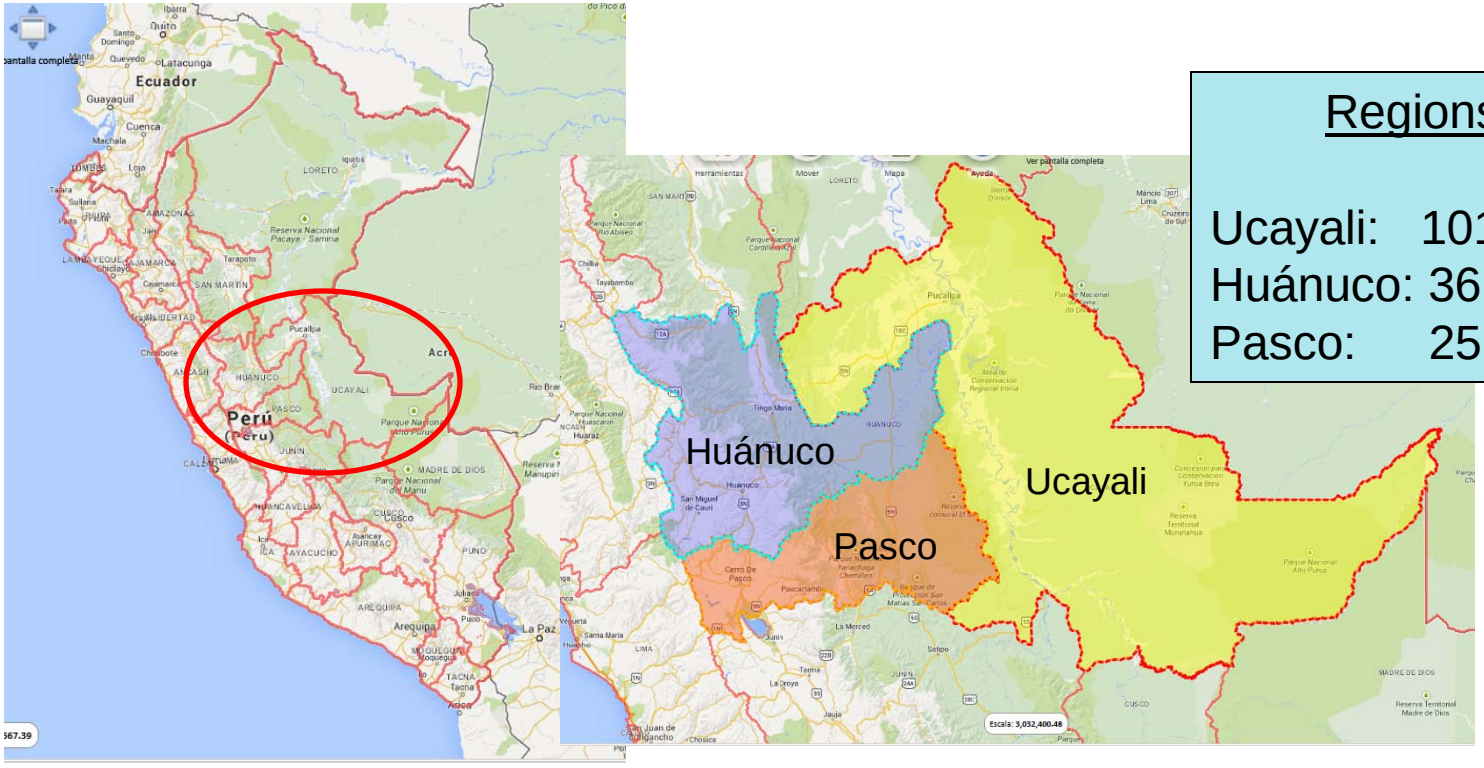
Partners

1. Private European companies.
2. Private National companies.
3. Private Forest Concessions.
4. Associations: ONG, comercial forest associations, research institutes.
5. European universities (Czech Republic, Poland)
6. Infotierra (Canadian company specialized in geomatics)
7. National Universities (Tingo María and Universidad de Ucayali)
8. Research Institute for the Peruvian Amazonia (IIAP – Ucayali)

Organizations



Location of the Permanent Research Plots Network



Regions (up to now)

Ucayali: 101,410 55 Km2
Huánuco: 36,848 85 Km2
Pasco: 25, 319 59 Km2

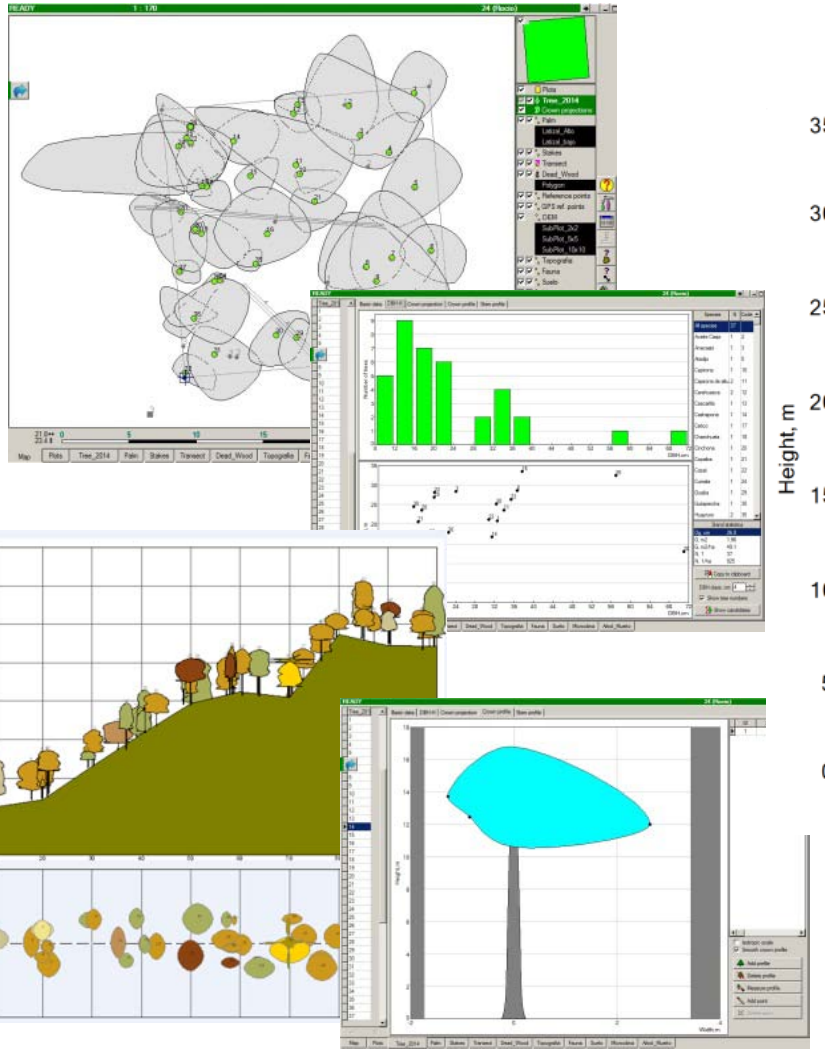
Región Huánuco: Establishment (with Field-Map) of a grid of 25 plots in differnt type of forests (2014).
Región Ucayali: Establishment (with Field-Map) of 6 plots (2013)
Región Pasco: Establishment (with Field-Map) of a grid of permanent research plots on coffee plantations under shadow and without shadow (2009)

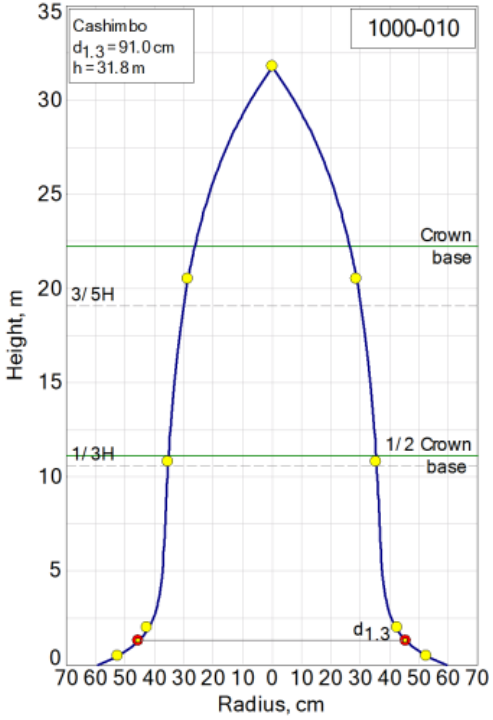
Objectives of internacional consortium of forest investigation and innovation

Mejorar la eficiencia técnica y de servicios a través de la investigación e innovación aplicada, en cada etapa de la cadena productiva forestal y agro forestal, para asumir los nuevos retos y metas del sector.

1. **To strenghtment of the capacities of the members of the cluster through applied research in each one of the phases of the productive chain.**
2. **The establishment and monitoring of the Permanent Research Plots Network in order to quantify the services given by the ecosystem.**
3. **The preparation of the volume tables for the main commerscial tree species in Peru.**
4. To support of the initiatives aimed at the establishment of forest plantations with native species in the Peruvian Amazonia.
5. Studies of alternatives for the generations of energy and use of wastes coming for the sawmills.
6. The establishment of the carbon footprint of the forest productive chain.
7. The establishment of the real growing rates for each species.
8. The establisment of the platform for exchange of information on the web.

Permanent Research Plot Network project





Field-Map®

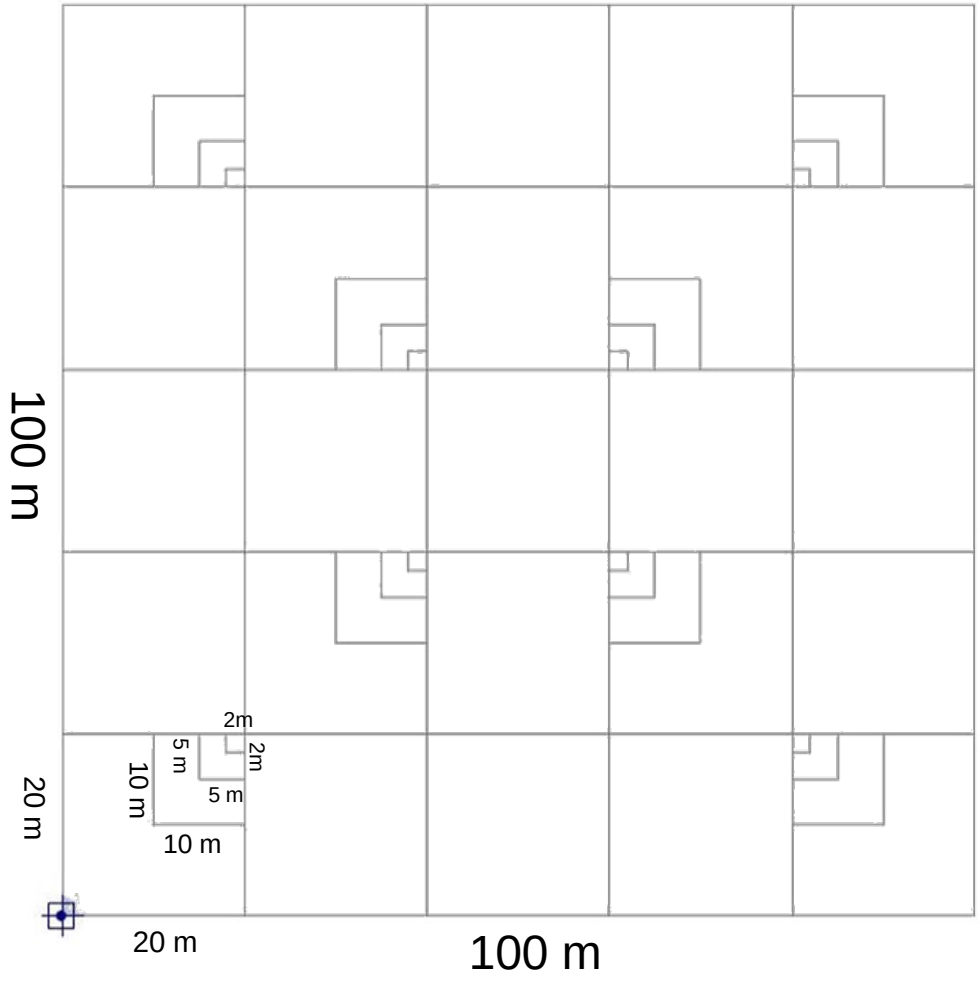
PRPN project basic info

1. Description of over 70 attributes.
2. Detailed and precise measurement with the Field-Map technology.
3. Variables for micro-clima, soil and water.
4. Over 20 diferent research specialisations.
5. Design of a platform for the administration of the monitoring data.
6. Monitoring cycle over 10 years.
7. Focus on the services provided by the ecosystems.
8. International and regional technical assistance.

Methodology

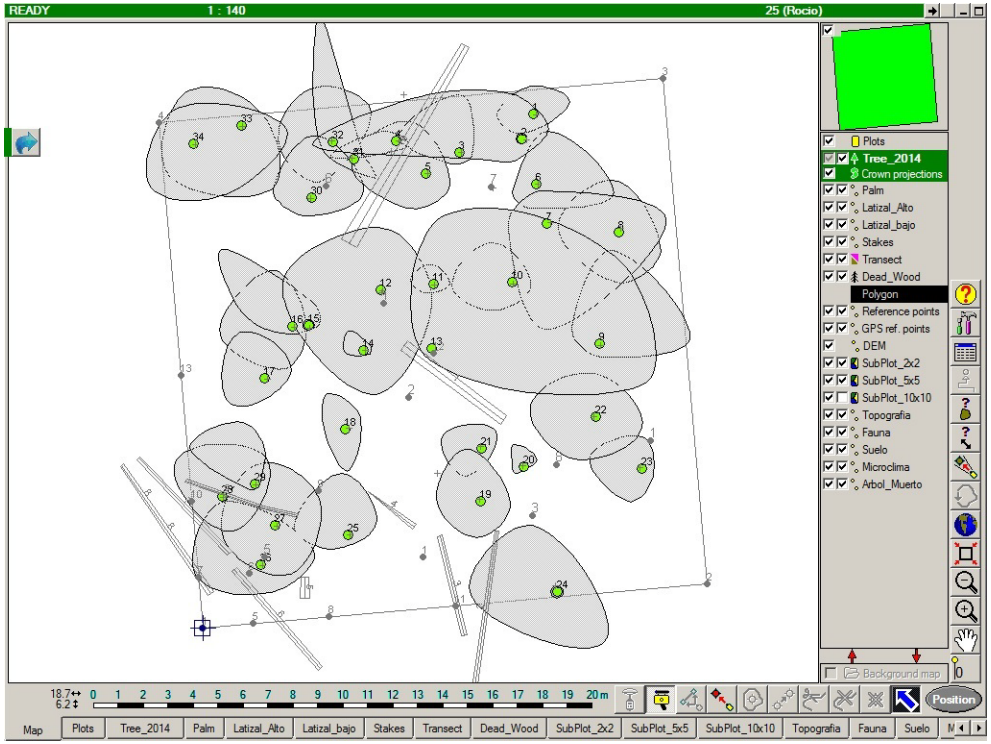
1. Plot design
2. Database
3. Equipments and materials
4. Field teams and organization
5. Field data collection
6. Measured variables and expected results
7. Stem profile equations for volume calculation
8. Technology (Field-Map)

Plot design



Sub Parcela	Measurements
20mx20m	DAP > 10 cm
10mx10m	10cm<DAP<5cm
5mx5m	DAP< 5cm – Altura Hasta: 1.5m
2mx2m	Trees up to 30cm of height And trees from 30cm a 1.5m of height

Database structure



1.Trees including stem profile, crown projection and crown profile
2.Branches
3.Transects
4.Dead wood
5.Stumps
6.Ecological variables
7.Topography
8. Fauna
9. Soil
10. Microclima
11. Regeneration
12. Climbers
13. Medicinal plants

Equipments and materials

- 3 Lasers.
- 3 Electronic compass
- 2 Field computers
- 2 PDA
- 2 Dentroscope - IFER
- Accesories: Monopod, tripod, cables y brackets, etc
- 4 Telescopic poles with reflectors
- 3 Metric tapes
- boards, hammers, painting, macheta

FIELD-MAP Hardware set - Integration

Laser rangefinder +
inclinometer +
electronic compass
+
IFER dendroscope

Field computer with
Field-Map

Field team and organization

- Field team 1: One engineer with Field-Map technology and one helper.
  - Tree positioning, stem profiles, deadwood.
- Field team 2: One engineer with Field-Map technology and three helpers.
  - Measurement of 3 diameter values 0.3m – 0.5 m, 1.3m and 2m;
  - Marcking
  - Ecological attributes
- Field team 3: One engineer with Field-Map technology and two helpers.
  - Crown projections and crown profiles, height, transects, remote diameters.
- Field team 4: One engineer with Field-Map technology and one helper.
  - Topography and plot fixation with markers.

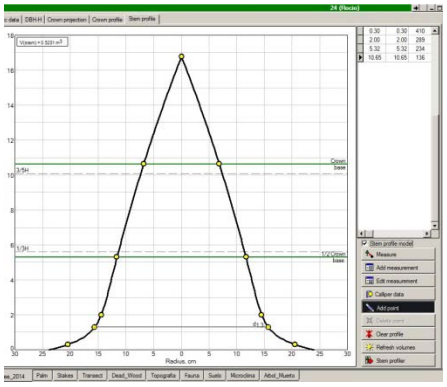
Field data collection

Precise data georeference

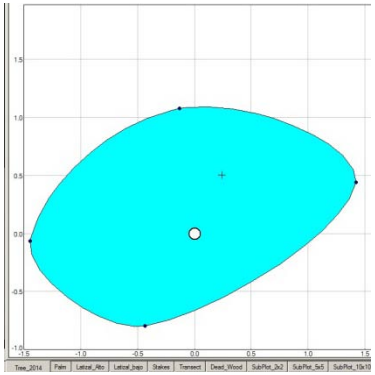
Precise heights

Ecological attributes

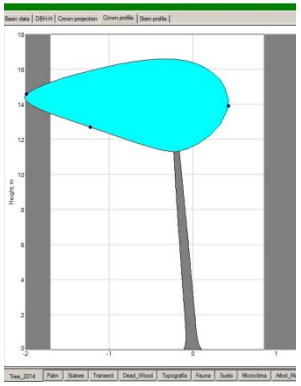
Measurement of stem profiles



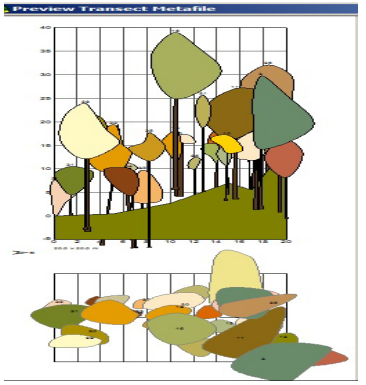
Stem profiles



Horizontal crown projection

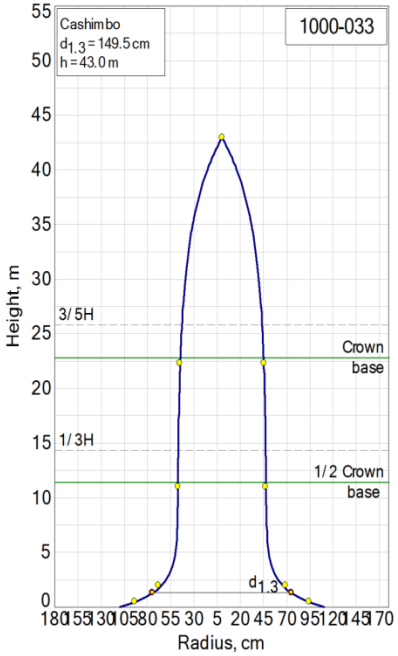


Crow vertical profiles



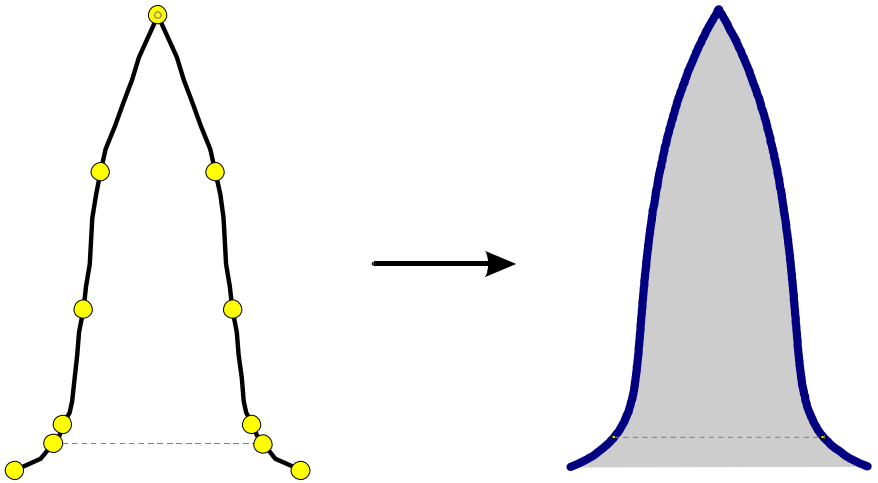
Forest structure

Preparation of the stem profiles for main commercial species



Methodology for volume models

- 6 points method (IFER)



10 to 12 trees per diameter classes across different conditions

- Stem shape model function

$$d_h = 2\left(\frac{i}{1-e^{q(1.3-H)}} + \left(\frac{d_{1.3}}{2} - i\right)\left(1 - \frac{1}{1-e^{p(1.3-H)}}\right) + \frac{\left(\frac{d_{1.3}}{2} - i\right)e^{1.3p}}{1-e^{p(1.3-H)}}e^{-ph} - \frac{ie^{-qH}}{1-e^{q(1.3-H)}}e^{qh}\right)$$

Riemer, T. & Gadow, K. & Sloboda, B., 1995

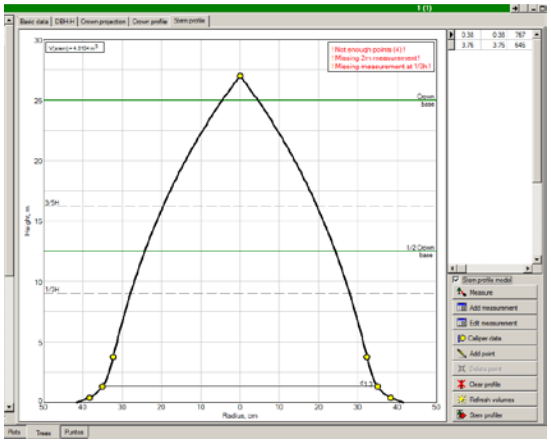
Diameter measured with tape

Stump diameter measurement

DBH measurement (1.3 m)

2 m diameter measurement

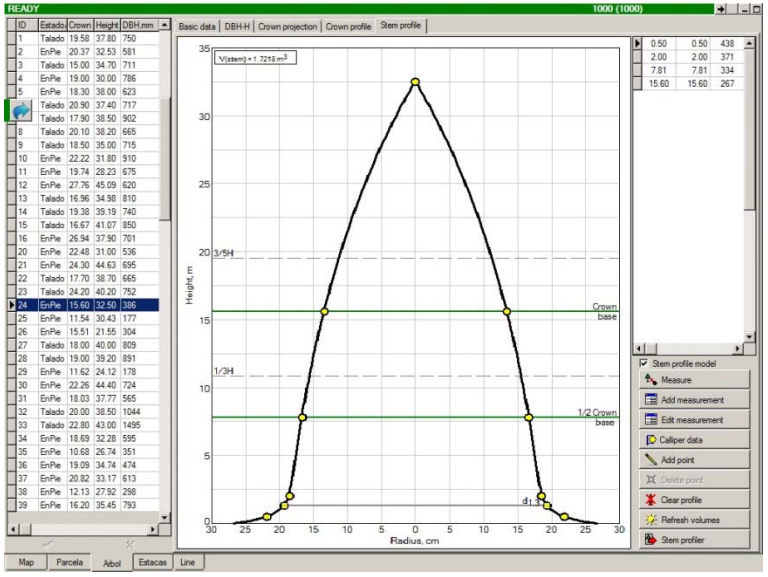
Entering data



Visualisation of the stem profile in Field-Map

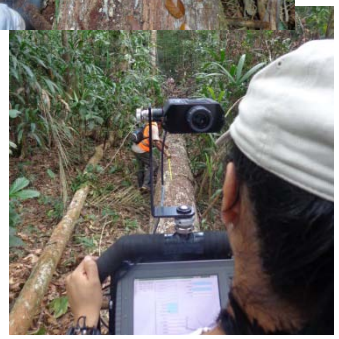
Remote diameters measured with IFER's dendroscope

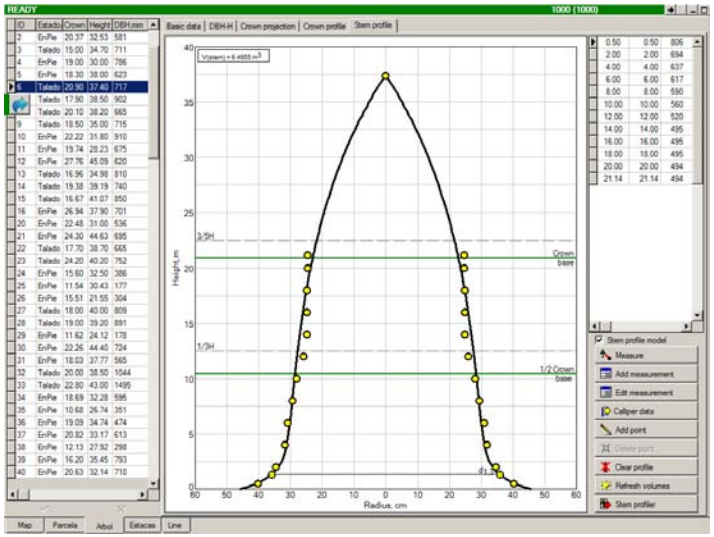
Calculation of remote diameters

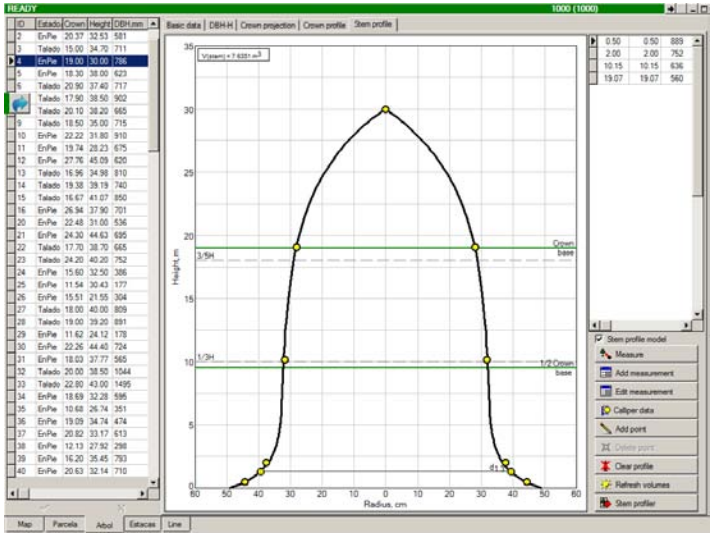


Volume calculation (in real time) of the standing trees

Verification of the 6 point method for Peru



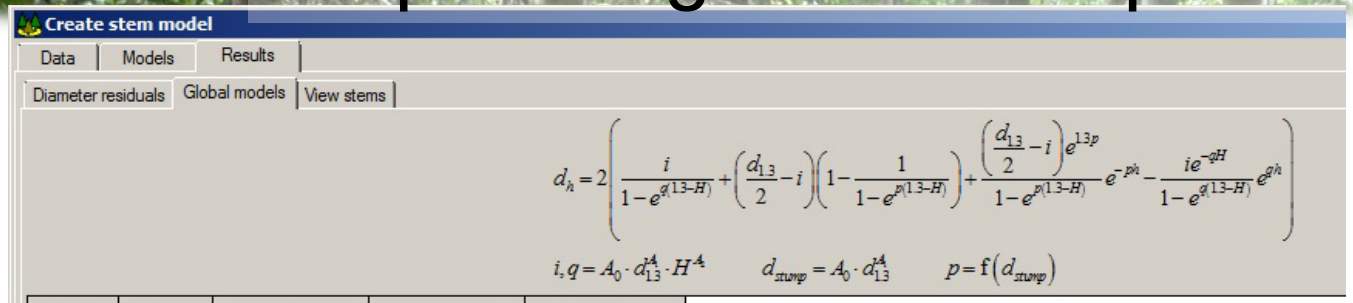




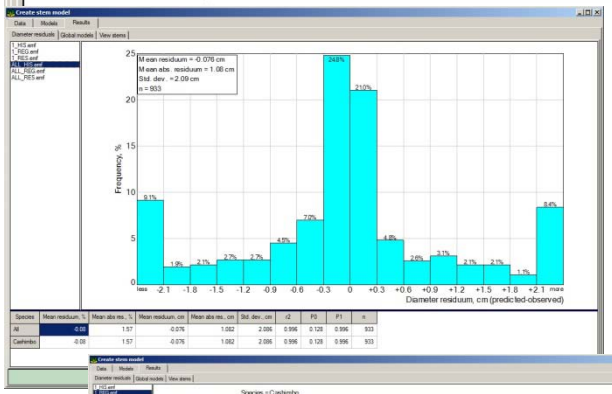
Reference data
- destructive sampling
- 2 m sections
- Volume calculation using Smallian formula

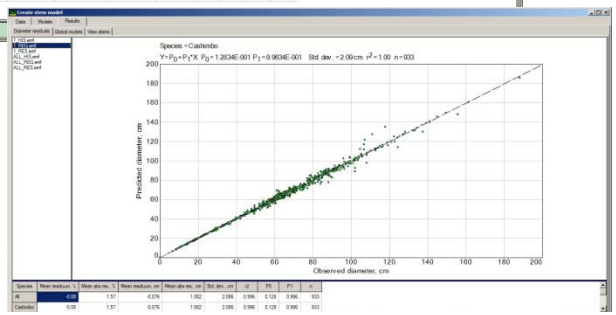
- Volume calculation using IFER's 6 points method

Parametrization of the cashimbo species global stem profile model

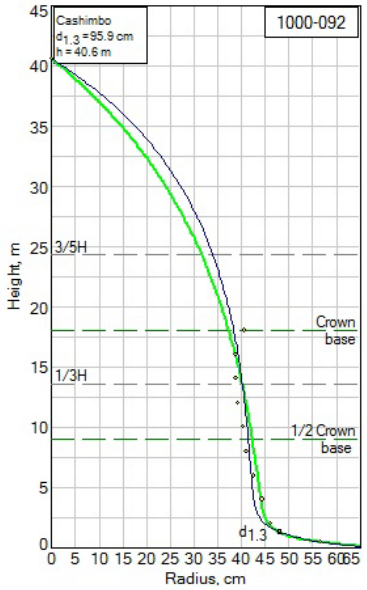


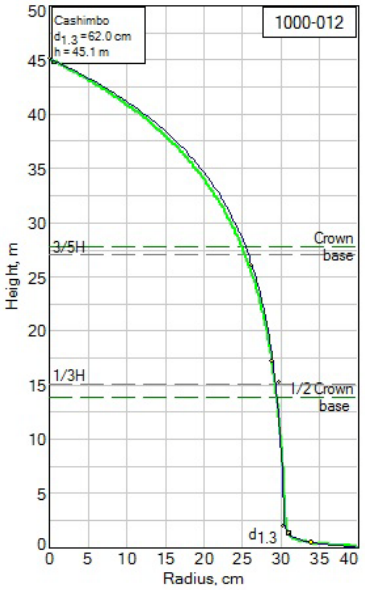
Species	Parameter	A0	A1	A2
Cashimbo	i	2.159266E-001	8.242572E-001	3.944732E-001
	q	2.278044E+003	3.030289E-001	-3.199337E+000
	dstump	1.171160E+000	1.000842E+000	



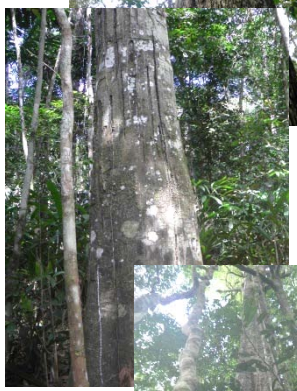


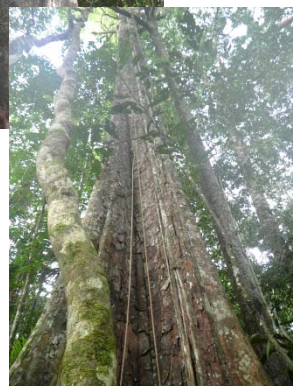
Statistics predicted - observed





Curves predicted - observed

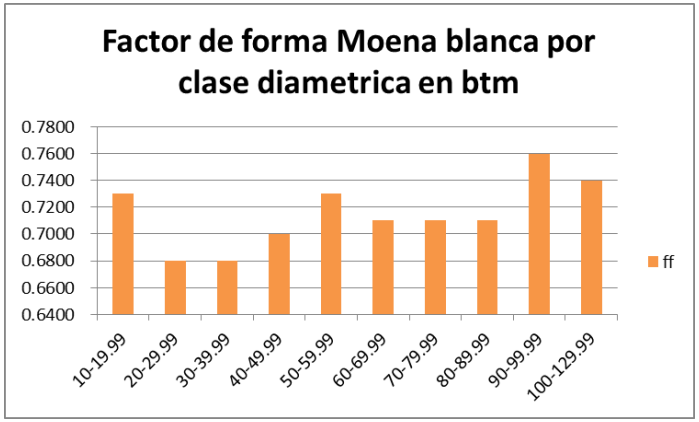




Variation of the volume correction factor for Moena species

Standard method of volume calculation in Peru uses 0.65 correction factor. The results of pilot study shows high variation of the correction factor in respect to the diamater classes (moena species).

ESPECIE	CLASE D	ff
moena	10-19.99	0.7300
moena	20-29.99	0.6800
moena	30-39.99	0.6800
moena	40-49.99	0.7000
moena	50-59.99	0.7300
moena	60-69.99	0.7100
moena	70-79.99	0.7100
moena	80-89.99	0.7100
moena	90-99.99	0.7600
moena	100-129.99	0.7400



MUCHAS GRACIAS

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