



## Methodologies used for establishing Non-detriment findings for endangered tree species in Africa



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# PLAN

- ITTO-CITES PROGRAM IN AFRICA
- GENERAL STRATEGY USED IN ADDRESSING NDF CONCERNS IN AFRICAN COUNTRIES
- METHODOLOGIES USED FOR NDF ON AFRORMOSIA (PERICOPSIS ELATA)
- METHODOLOGIES USED FOR NDF ON AFRICAN CHERY (PRUNUS AFRICANA)
- SELECTED OUTPUTS AND CONCLUSION

# ITTO – CITES Program: phase I

- The first phase of the Program (2008 – 2010) assisted countries in conducting fair forest inventories, developing simple management plans (SMP), dressing non-detriment findings (NDF) reports, and training control agents in the use of CITES tools;
- The program assisted in dressing NDFs and SMP on *Pericopsis elata* (Cameroon and Congo) and on *Prunus africana* (Cameroon and DRC).
- The program also assisted DRC in training control agents in the use of CITES tools.

# ITTO – CITES Program: phase II

- Under the second Phase (2012-2015), the program pursues the work started in phase I emphasizing on the development of NDF and SMP on *P. elata* in DRC, considered as the main reserve of *P. elata* in the Congo basin
- But the big challenge of the program in phase II is to assist range countries in (1) respecting the guidelines prescribed in the NDF reports and (2) implementing the SMP developed,



## General strategy used in addressing the NDF concerns in Africa



Step 1: formulation of the contracts for national experts in various fields of research;



Step 2: establishing the state-of-the-art on the management, exploitation, transport, processing, and exportation of the indicated species (*Pericopsis* and *Prunus*);



Step 3: verify/or conduct management inventories according to the national standards;



## General strategy used in addressing the NDF concerns in Africa



Step 4: definition of the national quotas on a scientific basis (MED, MDRF, Recovery rate: %Re);



Step 5: designation of an ad-hoc scientific expert group composed of researchers from universities and research institutions, and field forest officers to draft the NDF document;



# Afromosia work

- *Pericopsis elata* is semi gregarious to gregarious tree and uses to grow on flat ground, valleys and slopes.
- It is found in high density along rivers
- *P. elata* is a true pioneer species, stimulated to germinate by gaps in the canopy
- This plant species accepts soils of “Reddish-yellow latosols”, with an annual temperature of 23 – 26°C



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## Afrormosia work

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### 3. Inventories/Export quotas

The export quota was set in each country based on the data of management inventories. This was done differently according to the country;

The program did not get enough budget to conduct management inventories in all the area occupied by *Pericopsis elata* in the South East Cameroon (4 735 000.384 ha), in the North Congo (4 791 968 ha), and in DRC (38 407 553 ha),





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## Afrormosia work/Cameroon

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Elements of the management plan are précised in the arête *n° 0222/A/MINEF/ 25 may 2001*. This Arête sets the procedures of the elaboration and approbation of management plans, and the procedures for monitoring and control of the implementation of the management plans for the production forests, in the permanent domain,

# Afrormosia work/Cameroon

- The management plan is composed of five main sections including:
- (1) description of the natural milieu of the forest concession,
- (2) mapping,
- (3) management inventory,
- (4) Calculation of the forest possibility (stock)
- (5) Management measures/affectation of soils and use rights,

# Afromosia work/Cameroon

- Description of the natural milieu of the forest concession: it describes the biophysical characteristics of the forest, the socio-economic environment, and the history of the forest, based on appropriated studies,
- Mapping: stratification of the forest area at the 1/50 000 scale;
- affectation of soils, delimitation of five-year blocs and annual logging units.

# FOREST INVENTORIES

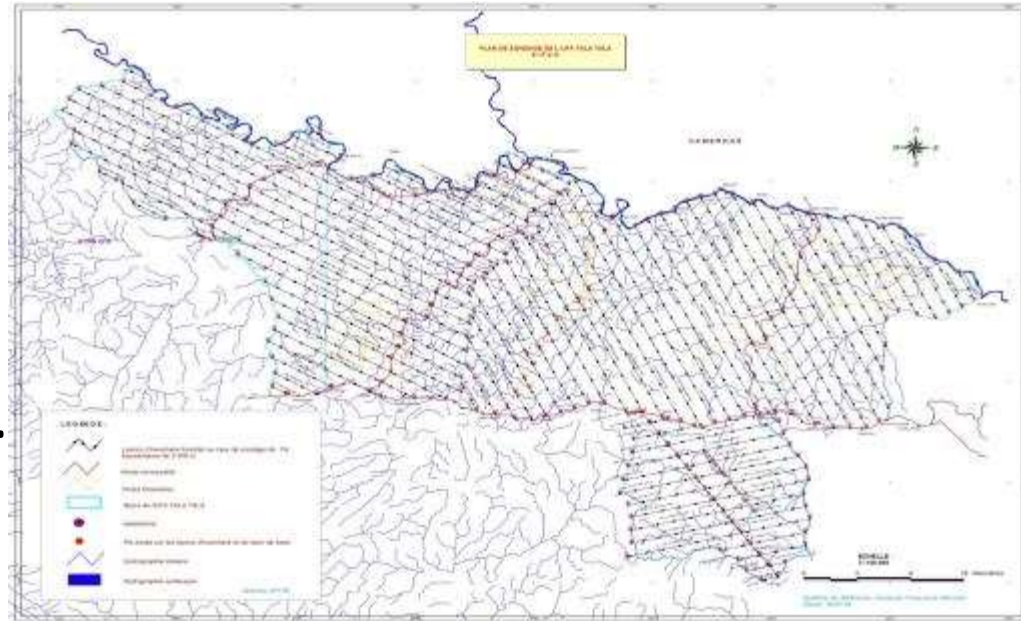
- The forest administration recognizes three types of forest inventories:
- Knowledge inventories: conducted at 1/1000 sampling rate, with view to have a general idea of the forest stands, often used for zoning the country;
- Management inventories (required sampling rates):
  - $SR \geq 2\%$  for a forest concession less than 5,000 ha;
  - $SR \geq 1\%$  for a forest concession less than 50,000 ha;
  - $SR \geq 0.5\%$  for a concession more than 50,000 ha
- Logging inventories: systematic inventory of exploitable trees (100%) in a given annual plot,

# Management inventories/Sampling design

- the sampling is systematic and stratified to 1 degree when the statistical unit is the plot.
- The samples or plots of 0.5 ha are distributed systematically throughout the entire population.
- The systematic disposal of plots allows to assume that the intensity of sampling for each stratum is proportional to its area in the forest.

# Management inventories/sampling design

- In practice,
- sampling is
- carried out
- along straight
- and continuous
- axes or transects.



- Transects are oriented along a predetermined cardinal direction but are systematically arranged in such a way that they are mostly parallel, equidistant and perpendicular to the general direction of both drainage and slopes.

# Management inventories/sampling design

- Rectangular plots arranged along a transect are contiguous (without alley or corridor of separation) and measure 250 m in the direction of the transect (length) and 20 m in the direction perpendicular to the transect (width).
- This gives a surface area of 0.5 ha for each plot.

# Management inventories/implementation of the sampling design

- **Counting**
- The counting step includes all operations relating to dendrological and dendrometric records:
- identification of stems of trees selected
- measurement of stems with diameter at breast height (dbh = 1.30 m)  $\geq$  10 cm in small plots (10 m x 10 m = 100 m<sup>2</sup>) and  $\geq$  20 cm in large plots (250 m x 20 m = 0.5 ha).



# Management inventories/data analysis

- For analysis, we determine:
  - the number of stems in different diameter classes, the density (number of stems/ha),
  - the minimum management diameter or the sustained diameter (MMD),
  - the stock of *P. elata* stems and the volume of *P. elata* per ha, per site, and in different diameter classes

# Management inventories/data analysis

- The MMD Is determined through the recovery rate/or reconstitution rate (Re) formula,
- The reconstitution rate (%Re) is an index which allows to know if the logged stems will be replaced by other stems situated below of the MED at the end of the rotation and at which proportion

# Management inventories/data analysis

- The reconstitution of the resource is good when  $Re$  is more than 0.5.
- The reconstitution rate takes in consideration the rotation, the growth rate, the mortality rate, the damage rate,
- Only trees with diameter MED/MMD + 3 classes are logged.
- Trees with diameter  $> MED + 3$  are left in the forest as mother trees as to ensure the regeneration of the resource

# Management inventories/data analysis

- $\%RE = (N_o (1-\Delta) (1-\alpha)T)/N_p$ 
  - $\alpha$ : natural mortality (1%) per year;
  - $\Delta$  : mortality caused by logging damage (10%);
  - T: rotation (30 years);
  - $N_p$ : total exploitable stems (MED + 3) to be reconstituted;
  - $N_o$ : number of stems of diameter classes  $<$  MED, which are used for the reconstitution (regeneration) of the resource

# Management inventories/data analysis

- $N_0$  refers to the number of trees which will reach the MED/MMD after the first rotation (30 years).
- $N_0$  is determined from the low limit ( $L_i$ ) of diameter classes which will reach the MED after the first rotation as follow:

# Management inventories/data analysis

- When using the reconstitution rate approach, one should have in mind two assumptions:
- (1) current conditions will be maintained during a certain time (at least during the incoming century) for what concerns the climate and the growth of trees,
- (2) the growth rate and the mortality rate defined in the literature using stations data can be applied on the whole forest concession, vast of more than 100 000 ha sometimes.

# African cherry work

- *Prunus africana* (Hook.f.) Kalkman (formerly *Pygeum africanum* Hook.f.) is a species of the Rosaceae family, known under its trade/pilot name as pygeum or African cherry.
- It is a mountain tree species of the tropical Africa, with a scattering distribution,

# Management inventory/sampling design

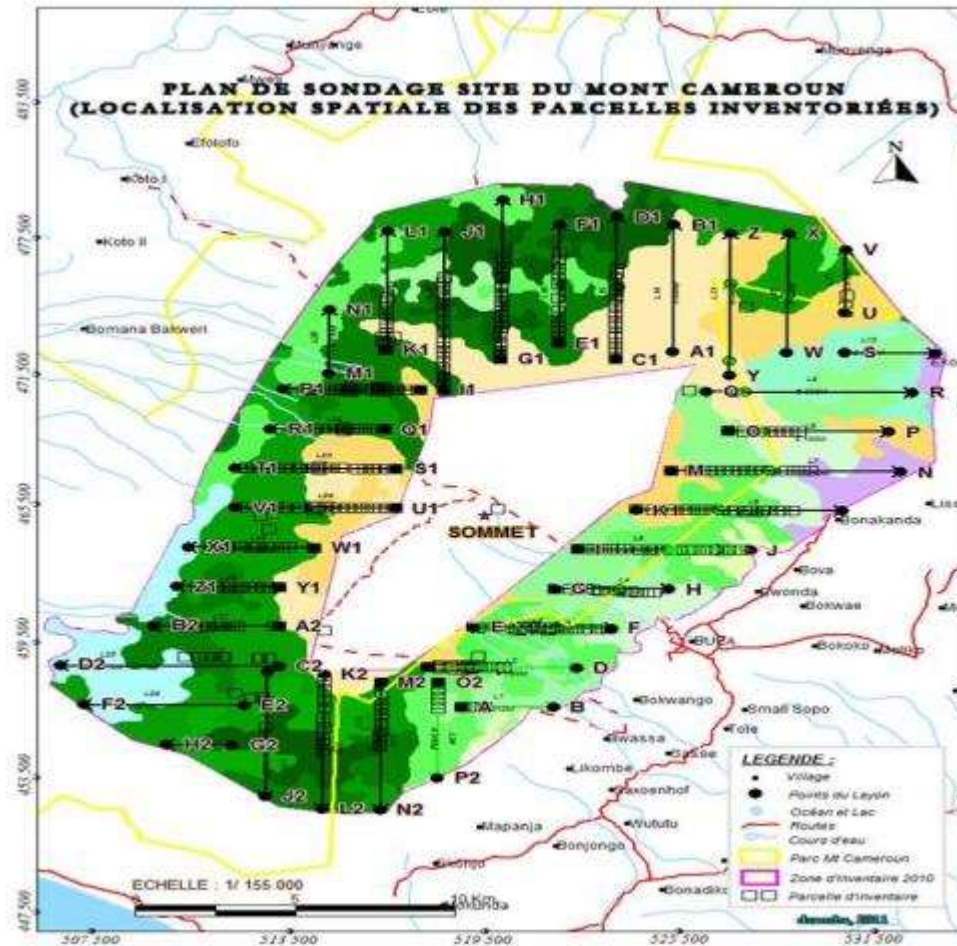
- The method used for assessing *P. africana* is called “Adaptive Clusters Sampling (ACS)”.
- This method has its basis in the known conventional (classical) forest inventory method often used for timber resources;



# Management inventory/sampling design

- Rectangular plots arranged along a transect as defined before.
- For the modified Adaptive cluster sampling (ACS) method, additional circular plots of 0.2 ha are added in respect of some conditions (rectangular plots with at least 4 stems).

# Management inventory/sampling design in Mount Cameroon



# Theoretical basis of the “adaptive clusters sampling (ACS)” method

- The ACS method is advised to capture the *Prunus* clustering characteristics. Considering  $y$  (total number of stems for example),
- the value of the parameter in the sampling unit (plot) of the traditional method, and  $C$  the condition (a limit number of stems for example) required to initiate an adaptive sampling,

# Theoretical basis of the “adaptive clusters sampling (ACS)” method

- If  $y \geq C$  in the indicated plot, additional circular plots are established in its periphery.
- If other units (circular plots) of the periphery have their  $y \geq C$ , then the process continues till obtaining a network of circular plots.
- The process stops when the condition can no longer be verified ( $y < C$ ).

# Theoretical basis of the “adaptive clusters sampling (ACS)” method

- Due to the small distance between two consecutive plots and in regard to the available funds,
- The ACS method was limited to a maximum of one circular plot,
- The distance of settlement of circular plots was fixed at 100 m, and the condition C was fixed at 4 stems,

# Theoretical basis of the “adaptive clusters sampling (ACS)” method

- This means that for each rectangular plot with  $C \geq 4$  stems, we added one circular plot of 0.2 ha at 1.00 m in left side and one circular plot of 0.2 ha at 1.00 m in right side.
- The ACS stopped at this level, notwithstanding the number of *Prunus* stems found in the circular plots.

# METHOD FOR TREES STUDIES

- A study for estimating the biomass of the bark carried/indirect method used:
  - Diameter at breast high and the thickness of the stem bark of each *Prunus* tree were recorded to establish the cubic tariff
  - The best equation which links the volume (V) of fresh barks to the diameter (D) of each *Prunus* tree in mount Cameroon is
  - $V = 0.00005 * D^{1.916}$ .
  - The average mass of an exploitable *Prunus* tree is 99.86 kg of fresh bark.

# METHOD FOR SIMULATING THE QUOTA (SUSTAINABLE YIELD)

- A simulation of the sustainable yield of *Prunus* bark is made from estimates of:
  - the natural population (stock),
  - the average yield per tree;
  - the rotation (length of time between successive debarkings) required to allow total recovery of the bark (Ondigui 2001).





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## Main outputs/Afrormosia work

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- DRC 2000-2011: 50,000 m<sup>3</sup> logs, sawn, veneer
- DRC 2012-14: 25,000 m<sup>3</sup> logs, sawn, veneer
- DRC 2015 quota 31,905 m<sup>3</sup>, round wood equivalent (the verification of inventory data completed, tracking system put in place)
- Cameroon 2010-2015: 14,400 m<sup>3</sup> sawn; slightly higher in previous years but no annual quota requests
- Congo 2012-2015: 2,223.3 m<sup>3</sup> logs; 5,039.1 m<sup>3</sup> sawn;



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## Conclusion and recommendations

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- The ITTO – CITES program:- high and perceptible impacts in range countries.
- Range countries assisted in implementing CITES rules;
- Trade companies motivated to ensure the sustainability of the resource in their forests;
- The glaring development challenge is to assist range countries to effectively implement management guidelines set in the NDF reports and SMP,



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## Conclusion and recommendations

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- The program has succeeded in assisting to develop several SMP, but little has been done for what concerns the implementation of those plans. This is the weakness of the program till now,
- Long research activities are needed to bring some realistic answers on many questions regarding the possibility of sustaining of *Pericopsis* and *Prunus* in the wild,

# Thank you for your attention

- 14th August 2015
- Mission of Validation
- In Alibuku/Kisangani
- forest Concession

