Prunus africana:

in situ conservation, sustainable management & governance

A B (Tony) Cunningham

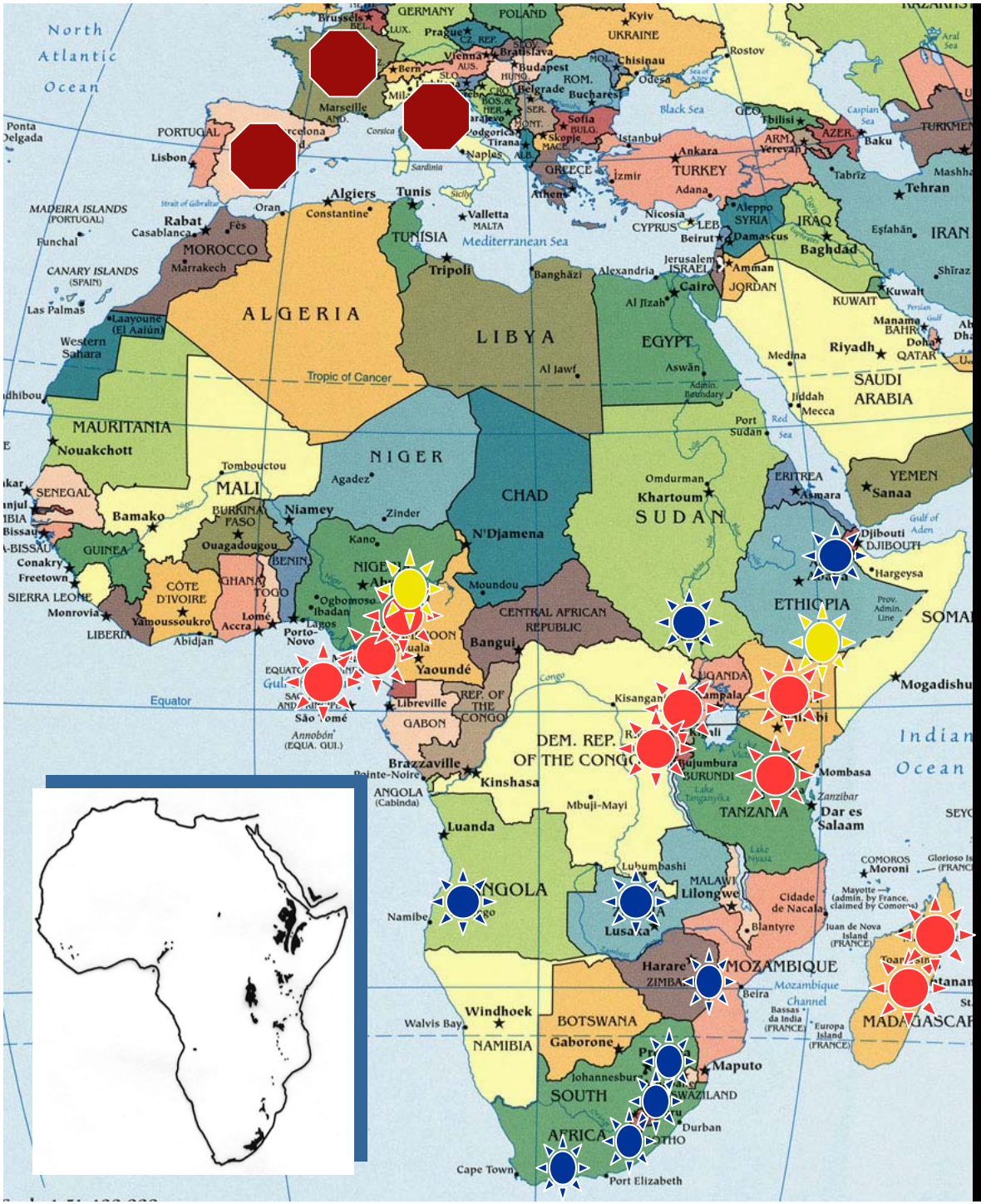
Meeting at CITES, Geneva: 2 Sept 2008

OVERVIEW

- **Introduction: *Prunus* values, ecology & Range States;**
- **Cases from Range States where trade is less well known;**
- **CITES & *Prunus africana*: background, aims & requirements;**
- **Sustainable wild harvest: What's a management plan - 5 steps;**
- **Governance & forest management: why worry?**
- **Planning or planting?**

Prunus africana: introduction

- **Considered the only African species in a genus of c.200 species;**
- **Very variable: Kalkman (1965) suggested that a separate species, *Prunus crassifolia* might occur in the Kivu region, DRC;**
- **Very different bark chemistry from populations in Kenya, Cameroon, Madagascar & DRC, early DNA work;**
- **wild relative of peaches, plums, almonds & apricots.**



RANGE STATES & TRADE: *Prunus africana*

= established trade

= emerging trade "frontier"

= traditional medicine trade only

= main importers

SITES & GEOLOGICAL HISTORY

- **Madagascan highlands**:
  - **North (**Tsaratanana mountains), Central-East (Ambatondrazaka and Moramanga) & possibly Central (Tampoketsan Ankazobe & Ankaratra mountains)

- **Volcanic highlands & islands, West Africa**
  - Cameroon, Equatorial Guinea (Bioko), NE Nigeria & Sao Tome e Principe

- **NW Ethiopian highlands**
  - NW highlands (uplifted Pre-Cambrian rock)

- **Volcanic highlands (Great Rift valley)**
  - SE Ethiopian Highlands
  - Central Kenya & Western Kenya
  - Tanzania: Kilimanjaro, Mt Meru, Southern highlands (Mbeya, Iringa)

- **Albertine Rift (volcanic highlands & uplifted block mountains)**
  - Uganda (Rwenzori, Kalinzu, Bwindi), DR Congo: Kahuzi-Biega); Rwanda: Nyungwe & Virunga forests.

- **Eastern Arc Mountains** (crystalline, uplift, 30my ago)
  - Tanzania (Uluguru, Udzungwa, Nguru, Pare & Usambara mtns;
  - Kenya (Taita hills)

- **Lowland Rift valley populations (Lake Victoria margins):** Kenya, Uganda (Mabira) & Tanzania (possibly near Mwanza)

- **Southern African Drakensberg (basalts & TMS)**
  - South Africa
  - Mozambique (Chimanimani)

- **South-central African inselbergs (granites)**
  - Malawi (Mt Mulanje)
  - Mozambique (Mt Chiperone & Mt Namuli)

- **South African Cape coast (river valleys through TMS)**
  - Bloukrans river (southernmost population)

SHIFTS IN USE & VALUE

- Since 1970, *Prunus africana* bark harvest has shifted from subsistence use to large-scale commercial use for international trade;

- Originally two initial brand-name products produced (France, Italy) to treat benign prostatic hypertrophy (BPH), now are at least 40 brand-name products using *Prunus africana* bark extract marketed directly in 10 countries & globally through the internet;

- Patents for new *Prunus africana* bark products have proliferated & c.4.5 million visits per year for a diagnosis of BPH (Wei, Calhoun and Jacobsen, 2005);

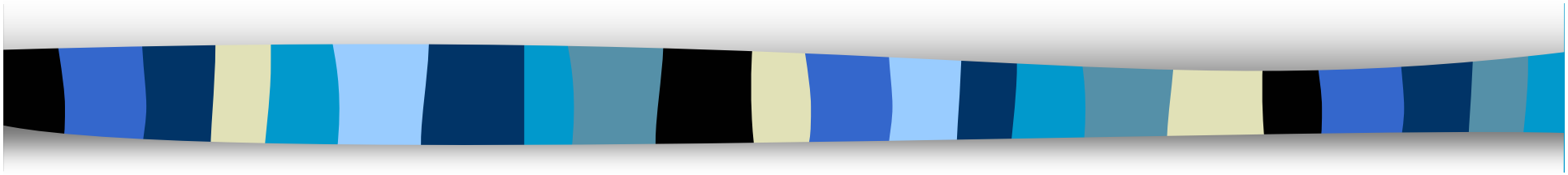
- OTC value US$220 million/yr (Cunningham et al, 1997). Annual export (2000 t/yr) from Cameroon worth 1.3 million Euro (Nsawir & Ingram, 2007).

LINKS TO LIVELIHOODS

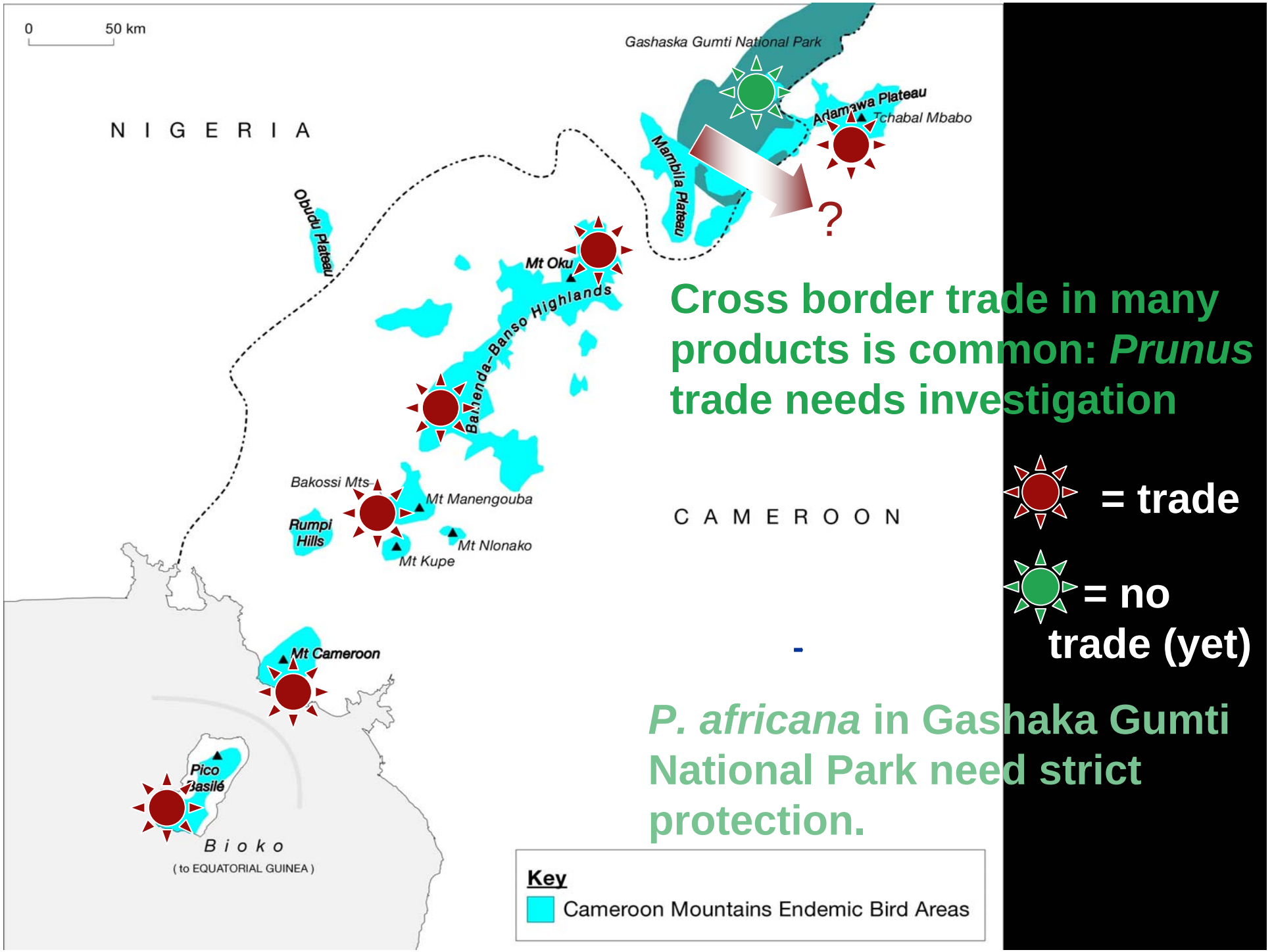
- Very important income source for people in highlands of montane Africa & Madagascar;
- Used as a traditional medicine (& also by non-human primates (eg: Fashing, 2004);
- Also for timber, fuelwood, axe & hoe handles & seed sales in Cameroon.

Fashing, P J. 2004. Mortality trends in the African cherry (*Prunus africana*) and the implications for colobus monkeys (*Colobus guereza*) in Kakamega Forest, Kenya. *Biological Conservation 120:449-459*

RANGE STATES



Trade situation in some Range States (Cameroon, Kenya) is better known than others (Madagascar, Nigeria, Tanzania)



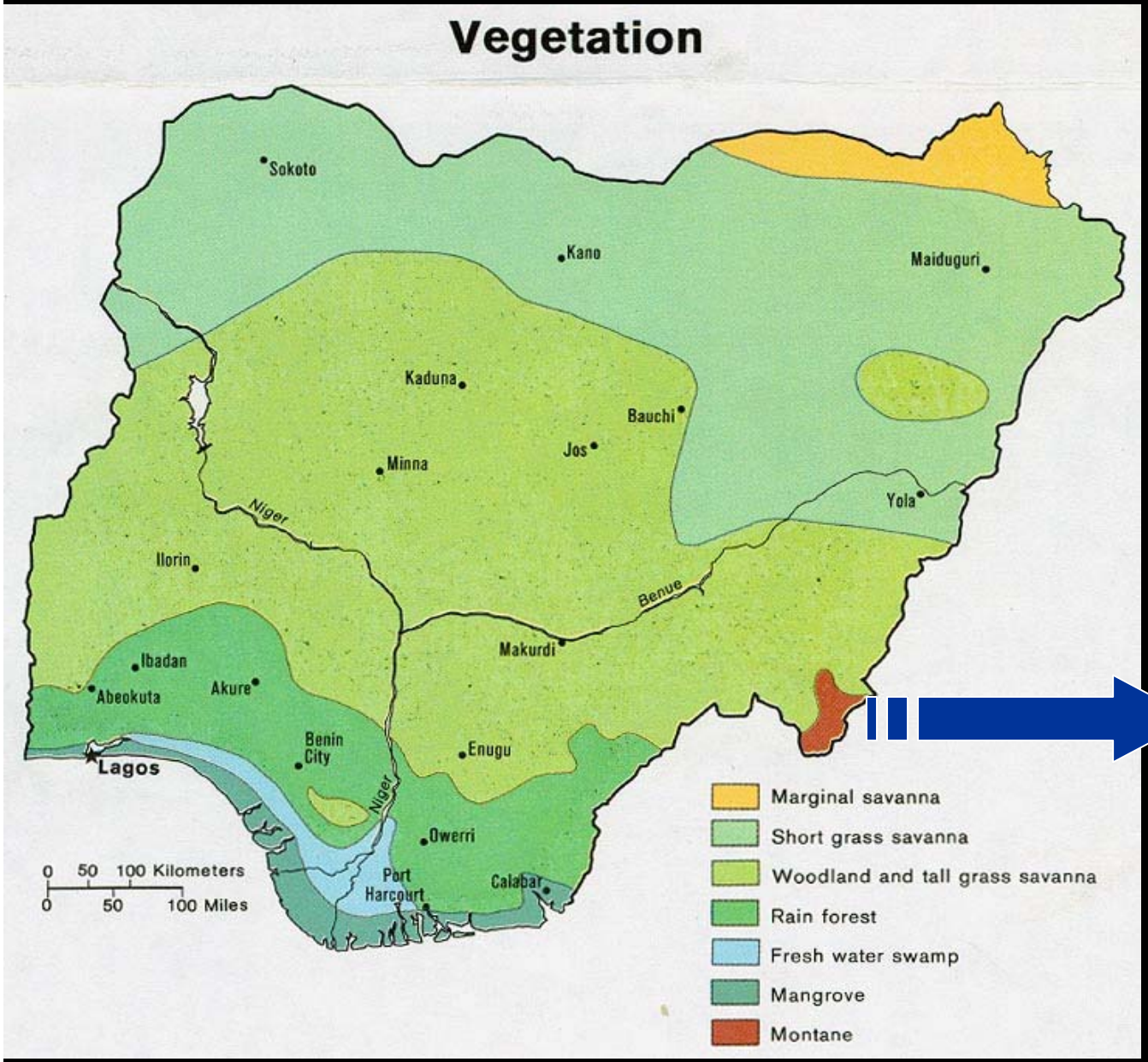
Cross border trade in many products is common: *Prunus* trade needs investigation

= trade

= no trade (yet)

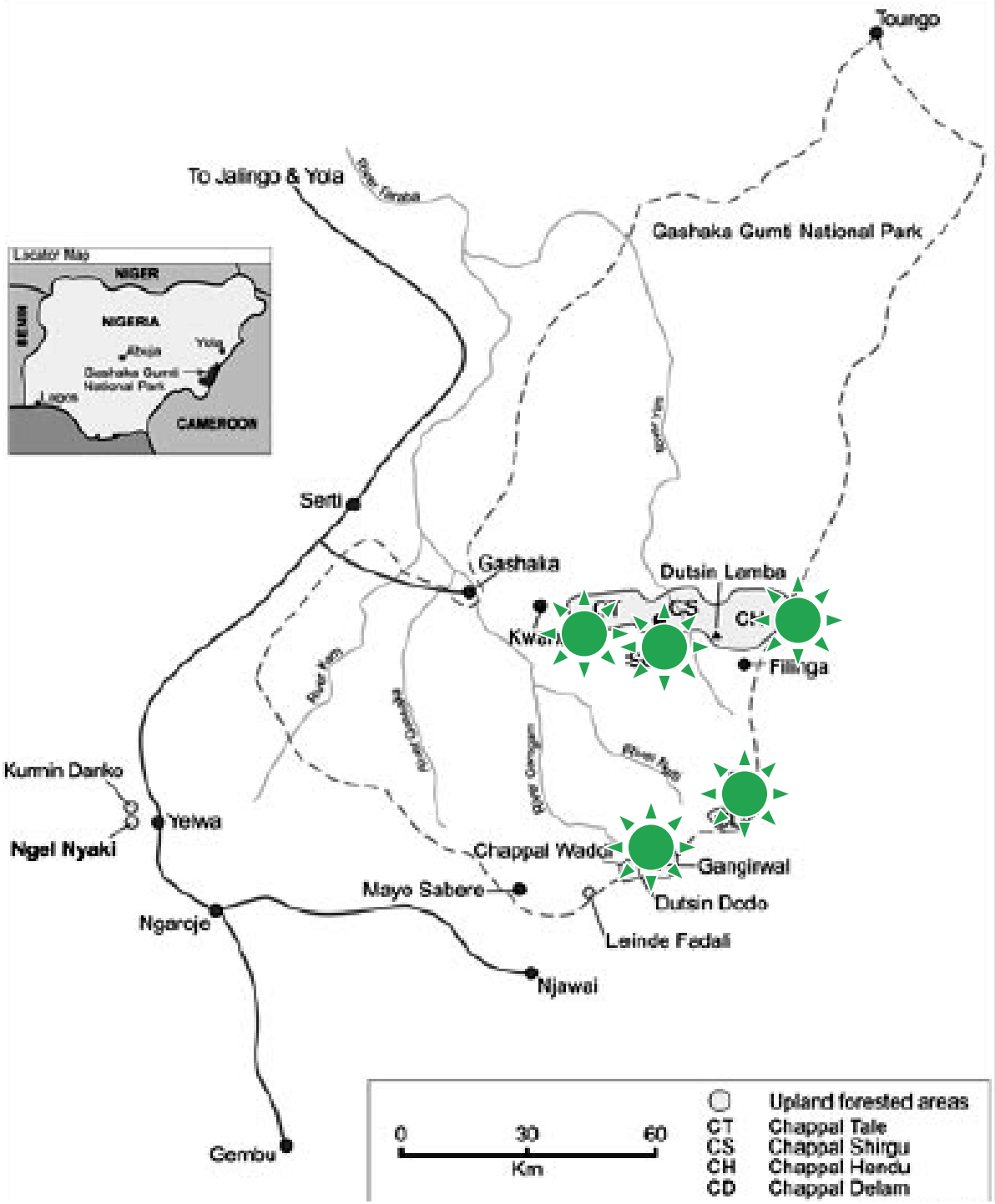
***P. africana* in Gashaka Gumti National Park need strict protection.**

NIGERIA: *Prunus africana*



- Gashaka Gumti National Park;
- Adamawa plateau

Ref: Chapman & Chapman, 2004; Chapman, 2008

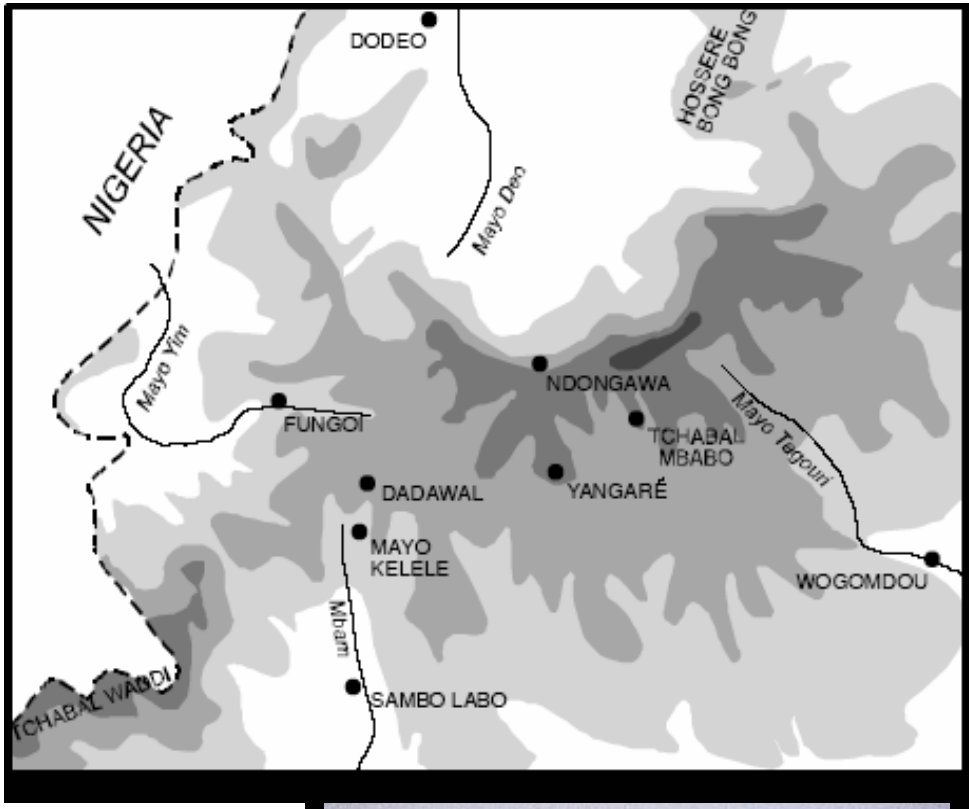


NE NIGERIA

Forests with *Prunus africana*

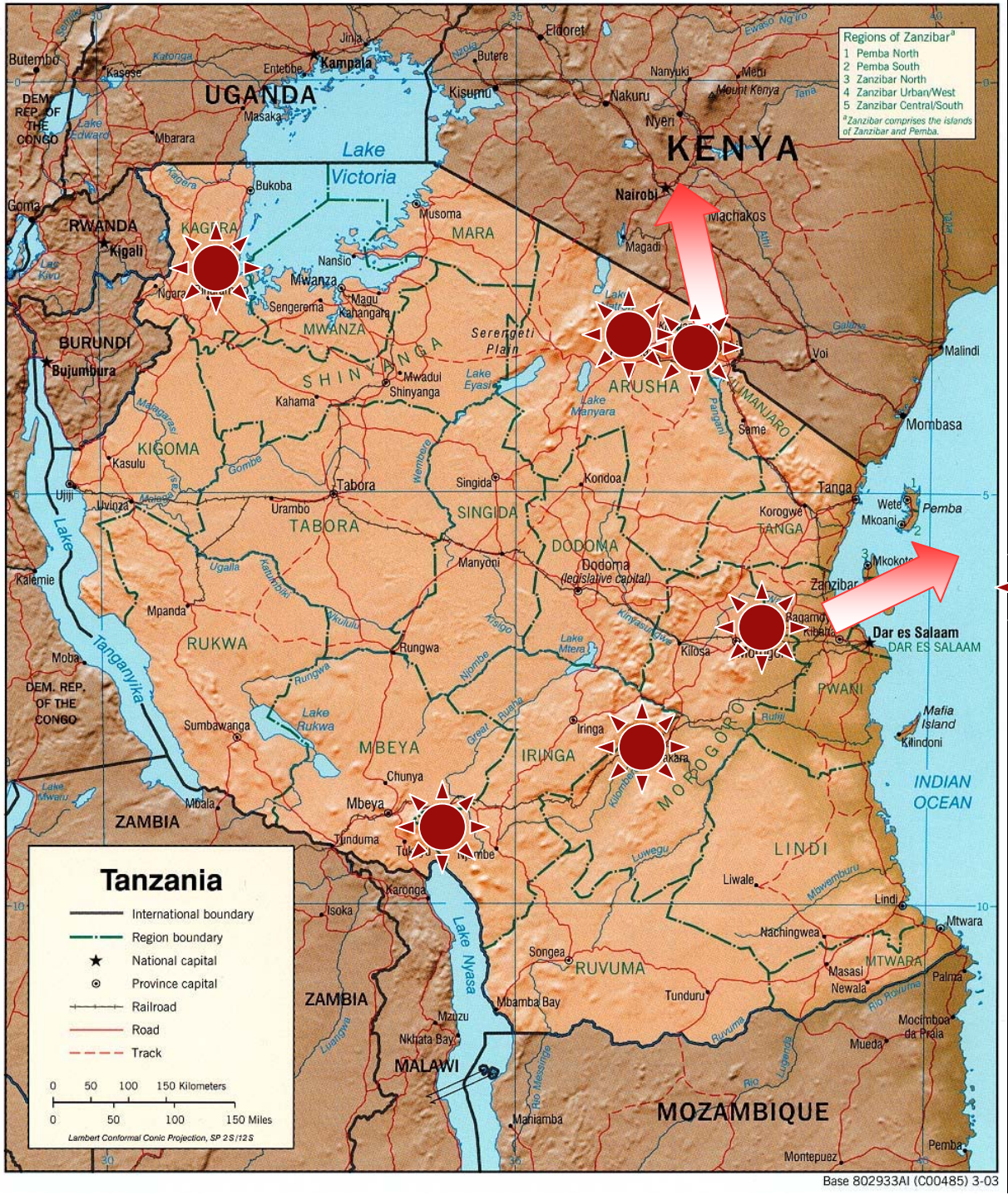
- **Gashaka Gumti is the largest national park in Nigeria;**
- **Chappal Waddi (= Tchabal Ouadè) is the highest point in Nigeria (Taraba State), Very close to the Cameroon border;**
- **Transfrontier conservation agreement signed 2003 (US$3.5 million through UNDP).**

CAMEROON'S LAST FRONTIER



- **Traders from Bamenda employed local people to strip *Prunus africana* trees on Tchabal Mbabo since c.2001;**
- **in 2003, Chapman (2004) reported extensive debarking & camps in the forest for bark exploitation;**
- **total stripping of trees, compromising transboundary conservation plans.**

Ref: Chapman, 2004

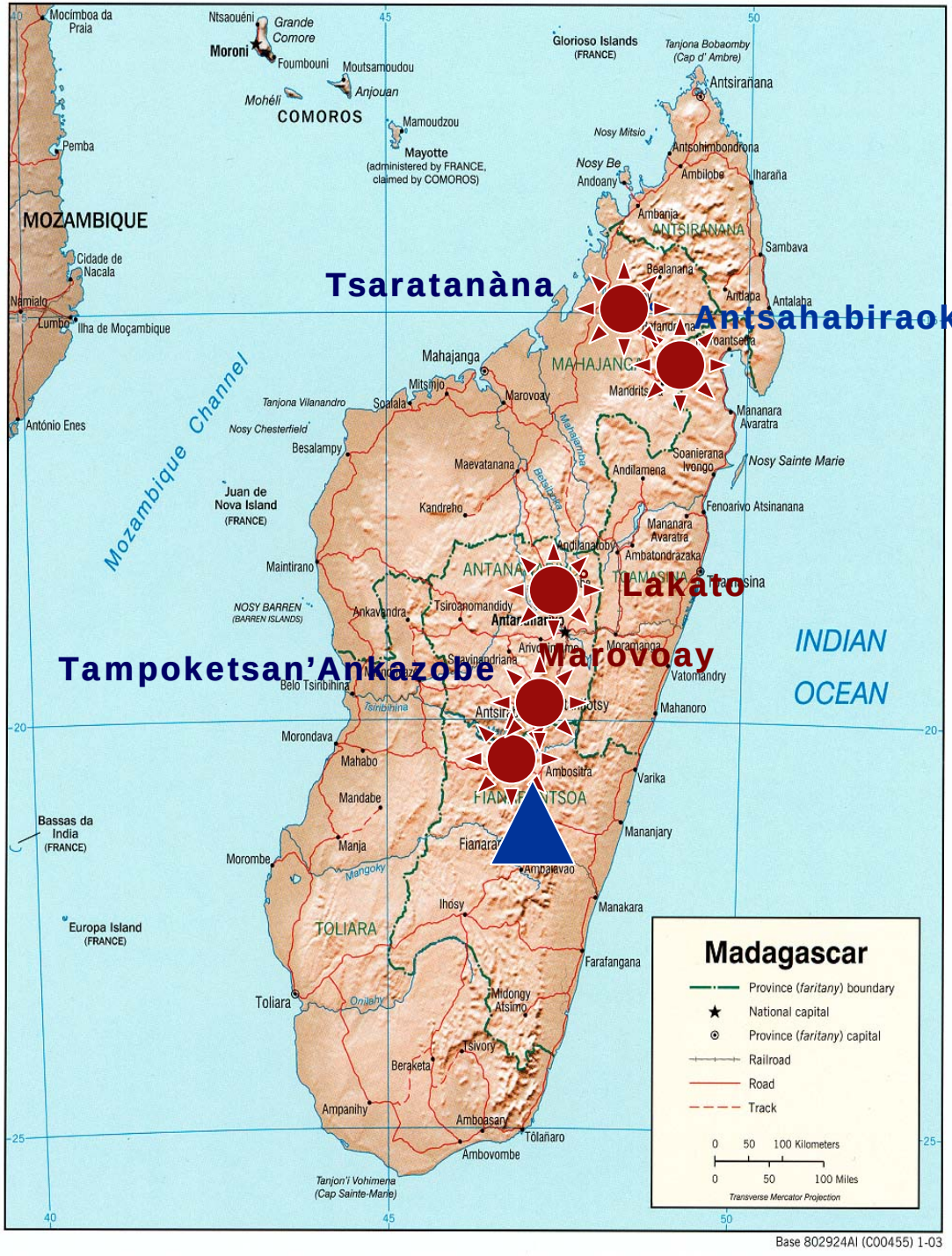


TANZANIA

Cross-border trade

***Prunus africana* locality**

Highest impacts are on *P. africana* populations on Mt. Kilimanjaro, close to the Kenyan border.



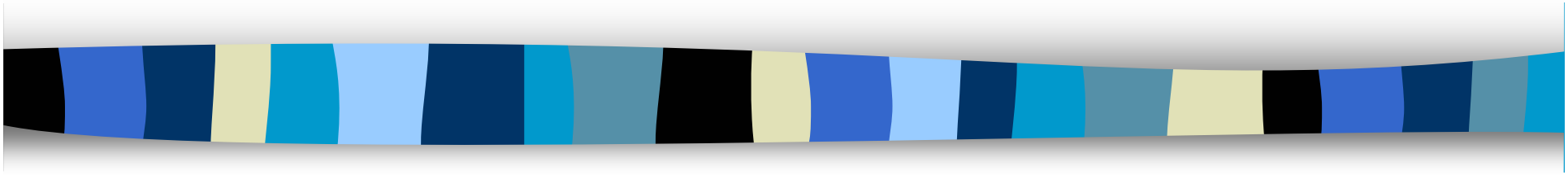
MADAGASCAR

= *Prunus africana*

= bark processing factory

Bark exploitation has been taking place in Forest Reserves (eg: Zahamena Special FR)

CITES & *Prunus africana*



Background, aims & requirements

WHAT DOES CITES DO?

- **provides a legal framework for regulating international trade in species threatened or potentially threatened by trade;**

- **based on issue of permits or certificates for international trade in species listed with different levels of trade control (Appendices 1-3);**

- **Each Country's Management Authority issues permits & compiles annual reports on their international trade in CITES-listed species for UNEP/WCMC CITES Trade Database.**

CITES & *Prunus africana*

- Proposed by Kenya for CITES App. 2 in 1994. Listed 1995;
- Focus on monitoring trade based on export permits, a requirement of Appendix II listed species;
- Export permits only supposed to be granted when certain conditions are met.

WHICH CONDITIONS?

- **Scientific Authority of the exporting country advises that export will not be detrimental to species survival;**

- **Country Management Authority is satisfied that product was not obtained in contravention of [redacted]onal laws for the protection of fauna and flora;**

- **Whenever a Scientific Authority determines that export should be limited to maintain that species population** *"throughout its range at a level consistent with its role in the ecosystems in which it occurs & well above the level at which that species might become eligible for inclusion in Appendix I* **the Scientific Authority shall advise the appropriate Management Authority of suitable measures to be taken to limit the grant of export permits for specimens of that species.**

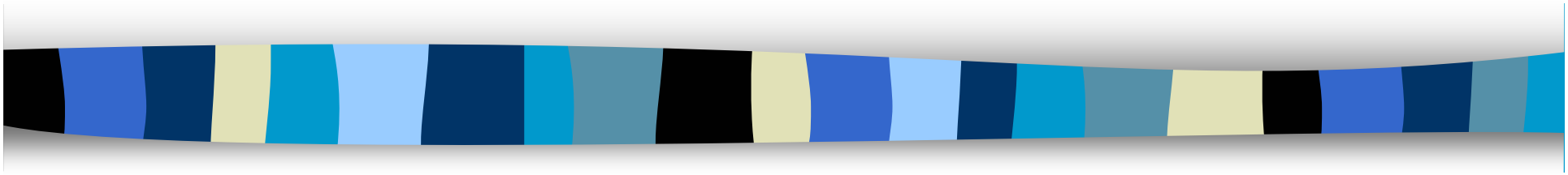
RECOMMENDATIONS: Prunus africana

CITES Plants Committee meeting, Lima, Peru. July 2006.

- **Effectively foster implementation of management plans in range countries;**
- **Coordinate promotion of thorough *Prunus africana* population surveys throughout its range;**
- **Evaluate *Prunus africana* production in natural ecosystems (doc PC16 Doc. 10.2.1);**
- **Encourage international cooperation projects *Prunus africana production* in agroforestry systems & plantations, including proper genetic diversity studies.**

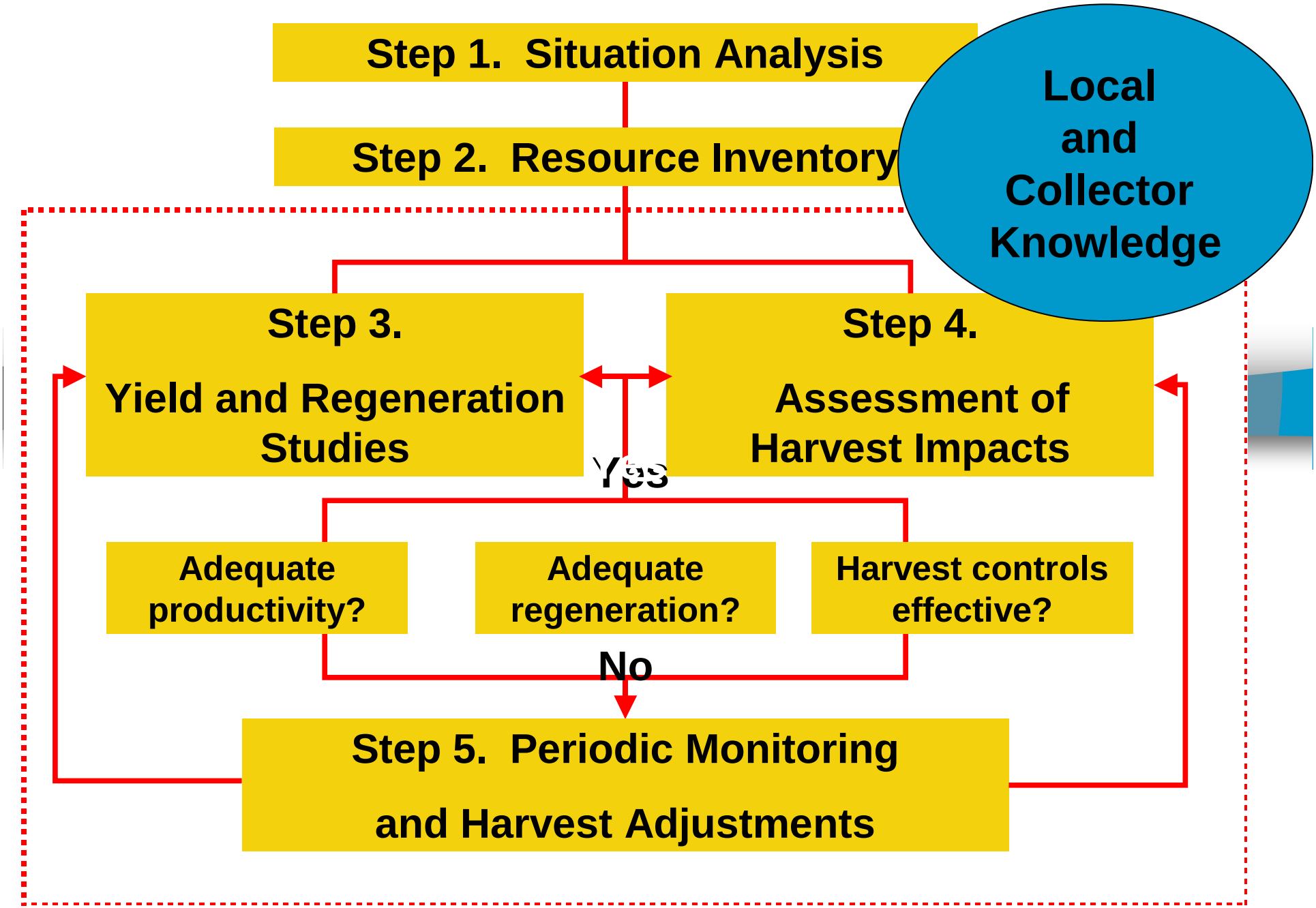
Ref: **CUNNINGHAM, A B. 2005. CITES Significant Trade Review of *Prunus africana.* CITES Management Authority, Geneva, Switzerland.**

What is a management plan?



What is a management plan for plant resources?

- Sets out plans for achieving their stated purpose for sustainable harvest management & monitoring;
- Clearly identifies priority issues, species & appropriate management scale;
- Normally in writing. Local harvesters rarely make formal written management plans. However, there can be advantages for them to do so;
- Developing a management plan enables stakeholders to communicate their planned management approach to people not as actively involved in the decision-making process.


Step 1. Situation Analysis
Step 2. Resource Inventory
Local and Collector Knowledge
Step 3. Yield and Regeneration Studies
Step 4. Assessment of Harvest Impacts
Yes
Adequate productivity?
Adequate regeneration?
Harvest controls effective?
No
Step 5. Periodic Monitoring and Harvest Adjustments

COMPONENTS OF THE PLAN

- Current situation, including map(s);
- Objectives for sustainable harvest;
- Organization(s) responsible for management & plans for building its capacity;
- Plans for the management area (including its management zones), accompanied by a map;
- Description of the resource species targeted for management;
- Results of the resource inventory & yield studies.

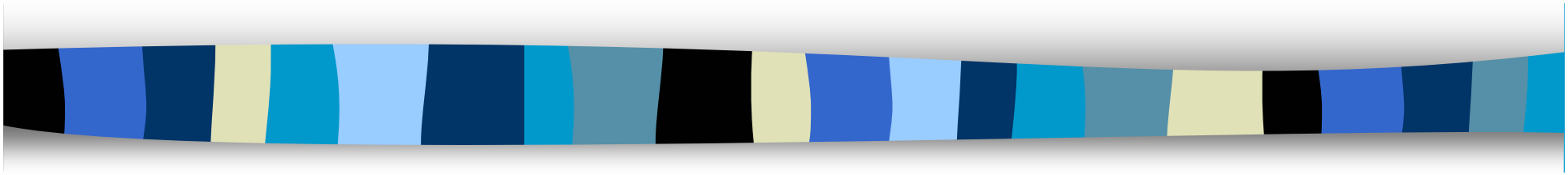
IMPORTANT NEEDS:

- Affordable in terms of time and money;
- Focused on priority species & at the right scale;
- Reliable & sufficiently accurate: no point if not reliable;
- Starts with an initial assessment of existing resource management practices (if any).

NEEDS

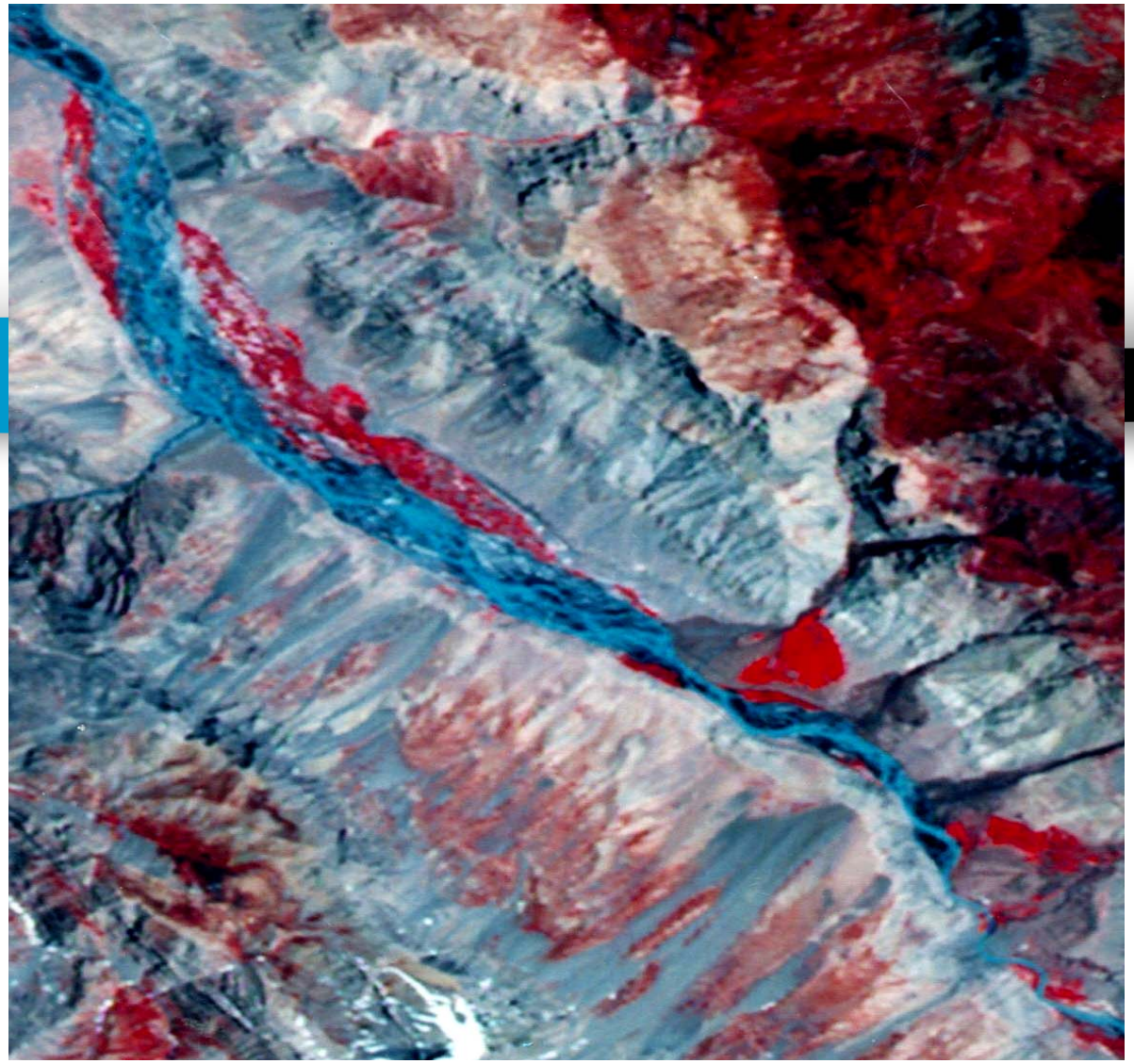
- Multi-year planning
- Building the stakeholder capacity;
- Management at a landscape level;
- Social aspects of plan[illegible]esource use;
- Enforcement of management rules;
- Political or legal aspects of NTFP & landscape level management;
- The community's financial strategy;
- Plans for monitoring;
- The community's strategies (financial, health etc) set out in the Management Framework.

Step 1. Base-line inventory



How much of the target species is present within the collection area?

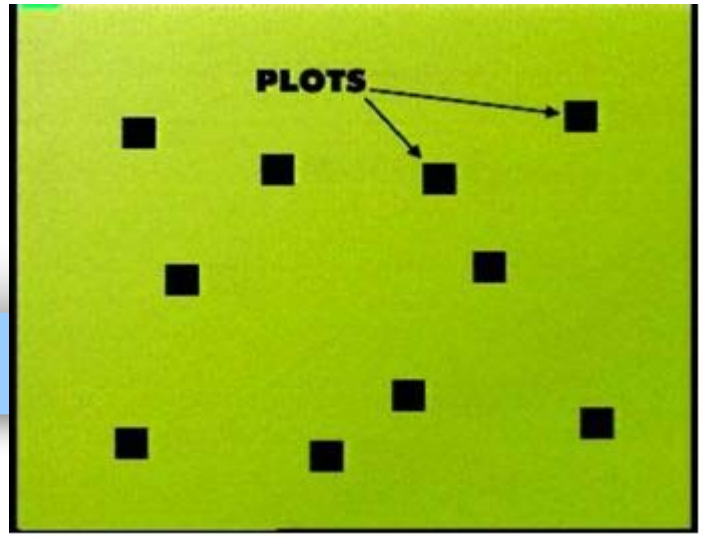
VEGETATION MAPPING



USE APPROPRIATE PRECISION

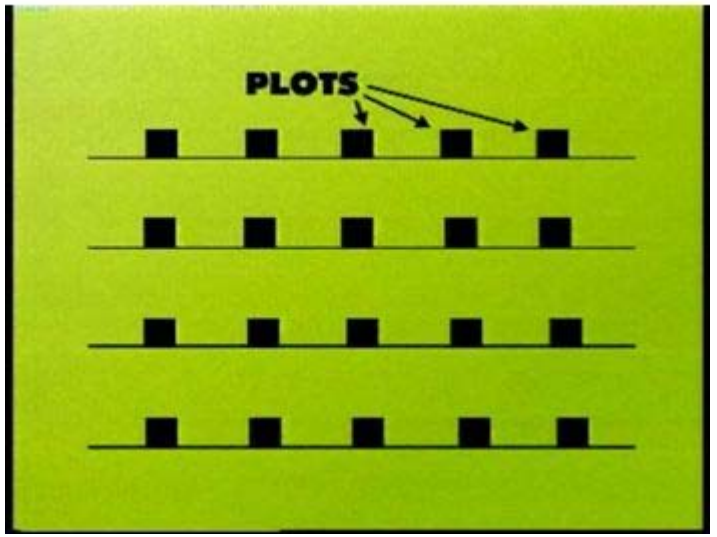
Random plots

- preferred by statisticians
- eliminate bias



Systematic sampling

- preferred by collectors & communities
- eliminates bias



Replication

- improves precision
- reduces chance effects

BASELINE SURVEYS

Machete

Compass

Tape measure

Paint

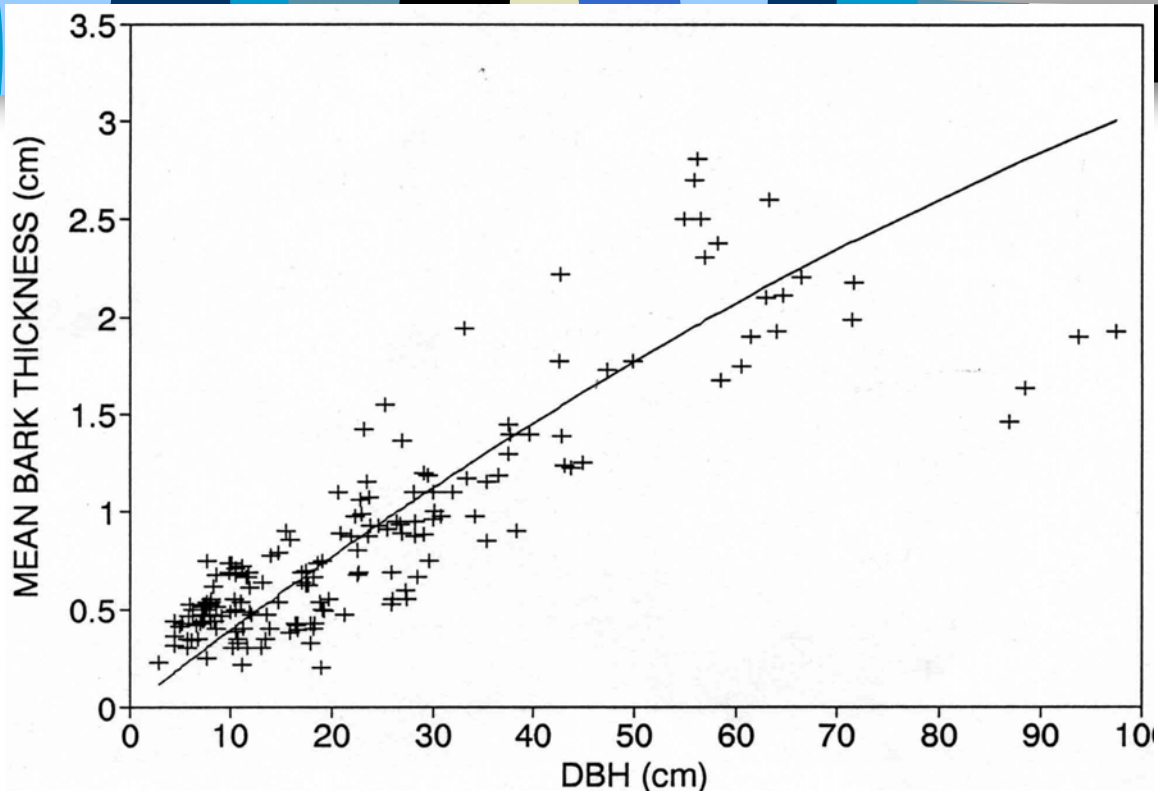
GPS – to locate and relocate samples

Ruler or clinometer – to measure slope/ height/ elevation

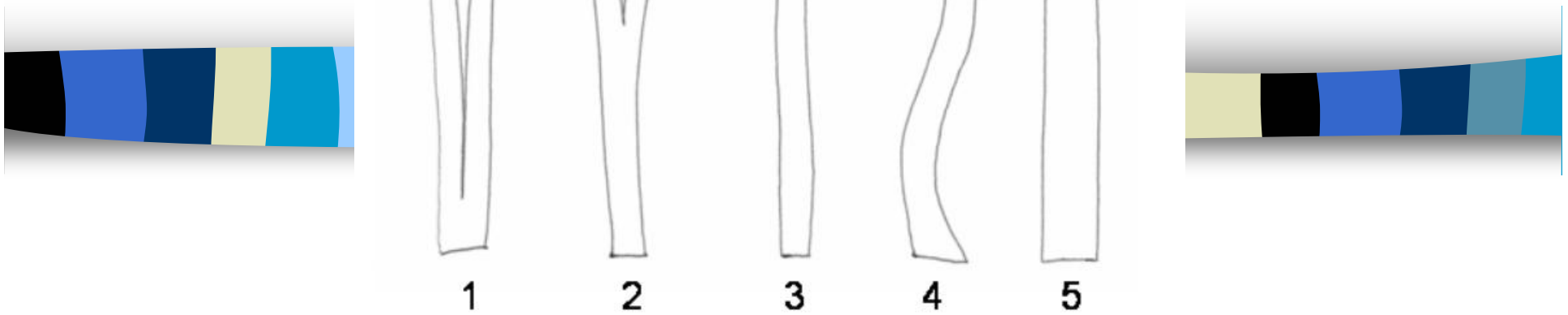
WHAT IS THE “STANDING STOCK”?

T

BARK BIOMASS & TREE SIZE

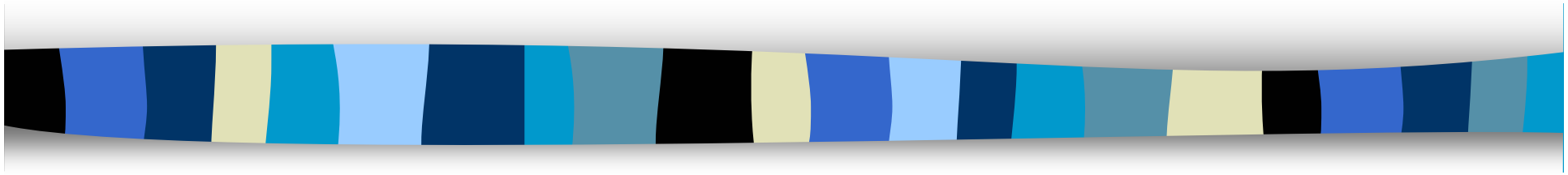


STEM FORM



- 1 – forked from bottom
- 2 – fork at less than 6 m height
- 3 – forking starts above 6 m height
- 4 – stem twisted
- 5 – stem straight

Step 2: Yield studies



- **How much of the desired raw material (quality & quantity) does the target species produce under natural conditions?**

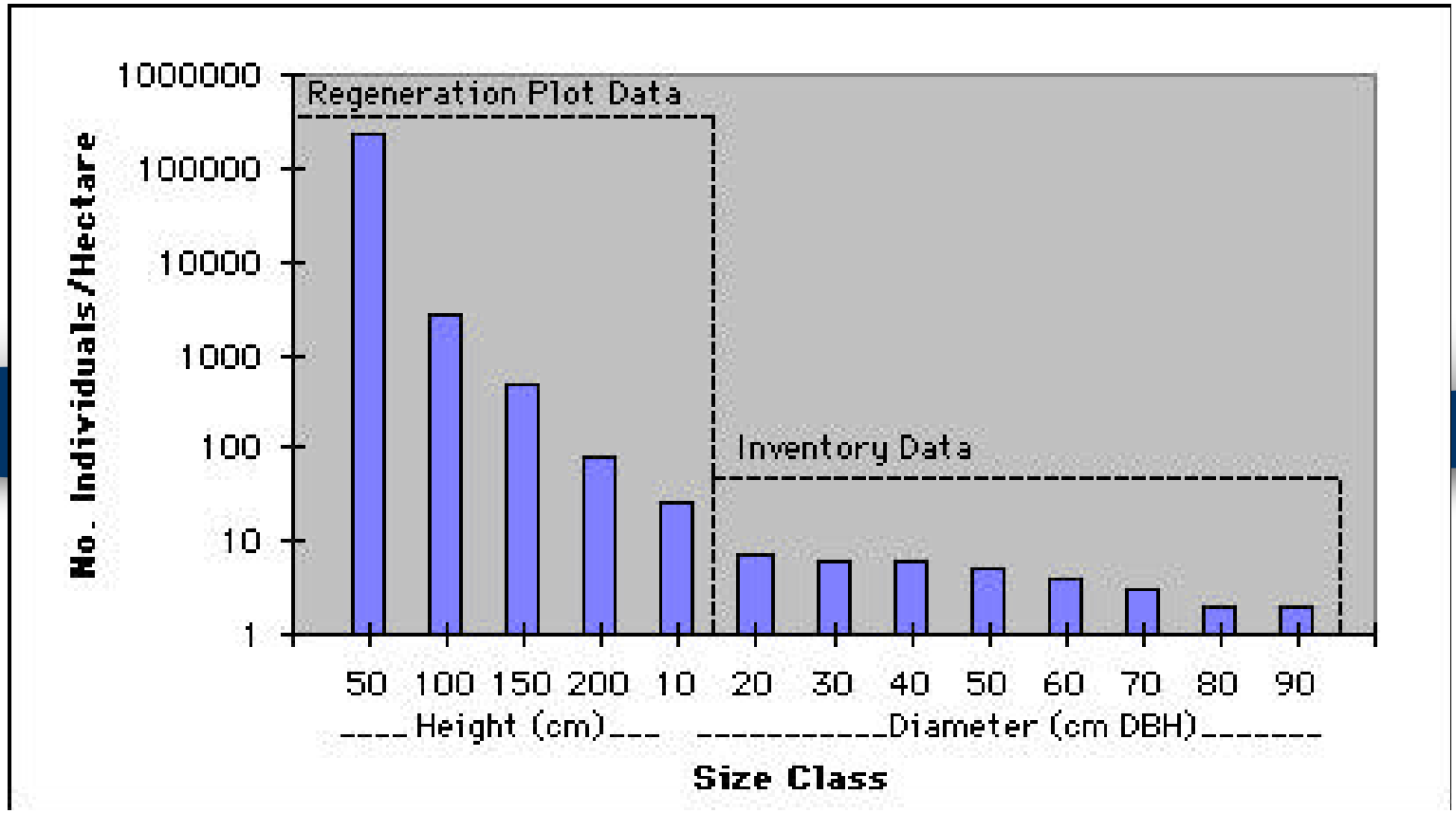
- **What is the regeneration rate of harvested populations / individuals?**

BARK YIELDS

- Increase with tree size & tree health (growth rates (soils, rainfall, genotype) & other impacts (pests, other harvest);
- Impacted by conflicting uses (eg: felling for timber);
- Different management strategies - depend on whether “fine-tuned” wise management is possible;
- Fresh bark mass about twice that of dried bark. 1000 kg of dry bark from mature trees makes 5 kg of extract. An average mature tree yields 75 kg of bark.

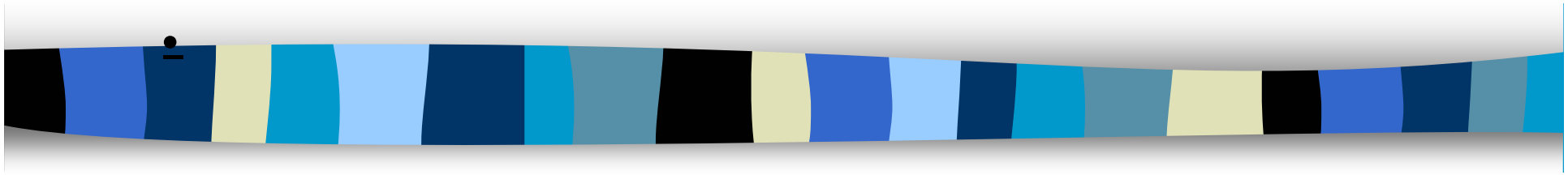
BARK CHARACTERISTICS & RECOVERY RATES

INVENTORY + REGENERATION DATA



Size-class histogram for *Shorea atrinervosa* population illustrating the use of both height and diameter classes. Data from regeneration plots have been grouped into four 50 cm height classes and one 1.0 - 10.0 cm diameter (DBH) class. Inventory results are divided into eight 10 cm (DBH) diameter classes. Numbers shown along x-axis represent the upper size limit of each class. Note compressed, logarithmic scaling of y-axis due to the large range in values (e.g. from 3 to 250,000). (Source: Peters, 1994)

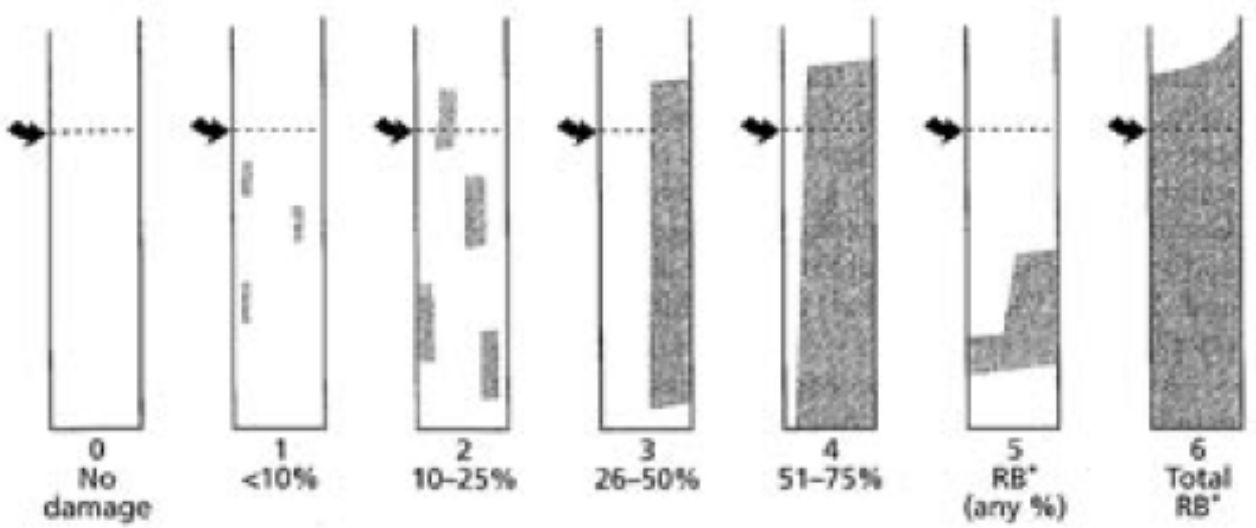
Step 3: Assessment and periodic monitoring of harvest impacts



- **What is the impact of the current harvest protocol on the target population and ecosystem?**

- **Is the management action successful?**

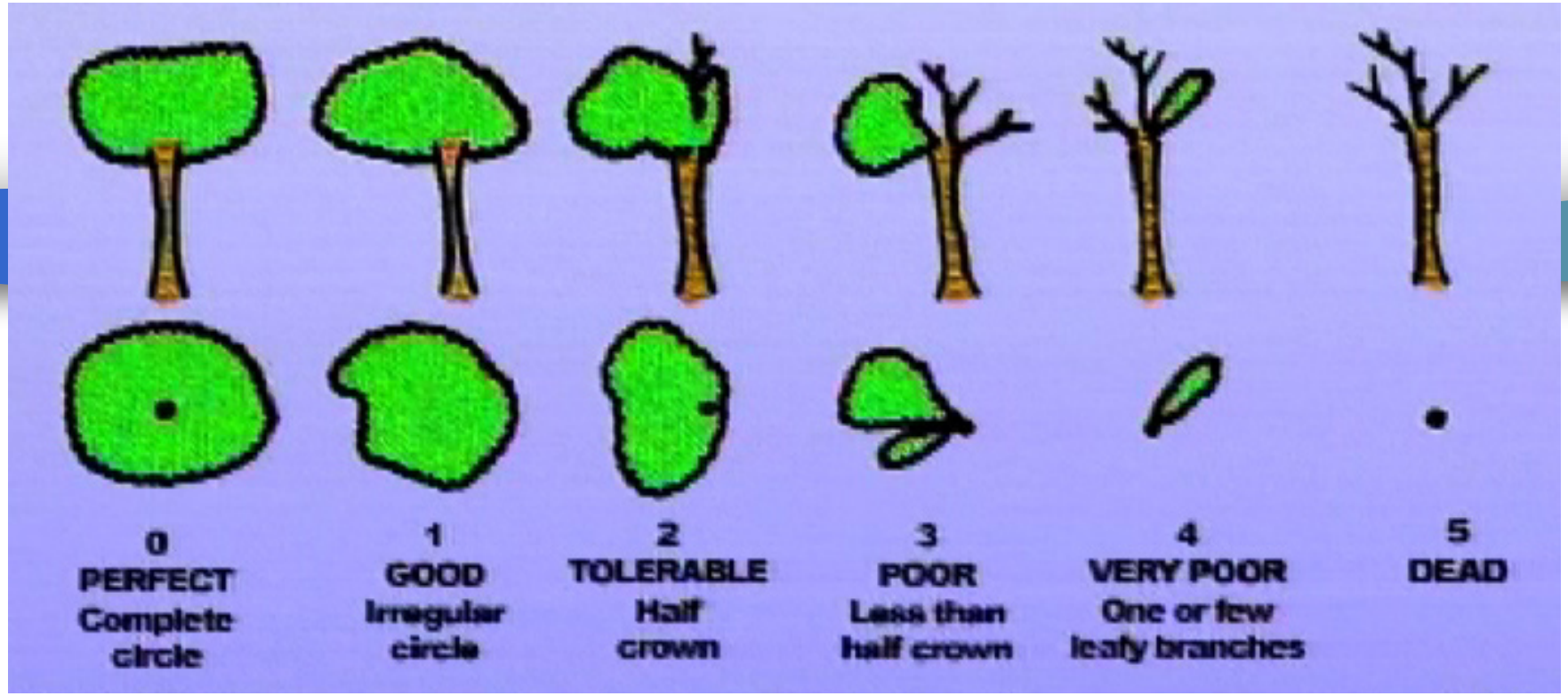
ASSESSING BARK DAMAGE



Cunningham, 2001

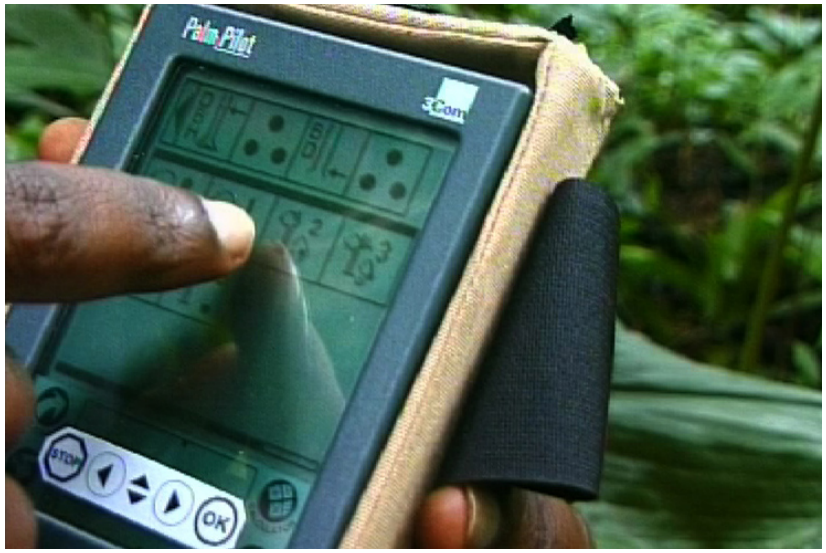
0 = no damage
1 = small patches removed (<10% of trunk bark)
2 = larger patches removed (10-25% of trunk bark)
3 = large strips removed (26-50& of trunk bark)
4 = extensive bark removed (51-75% of trunk bark)
5 = ring-barking or girdling (leads to death in many species)
6 = complete girdling, all bark removed (certain death)

TREE CROWN HEALTH

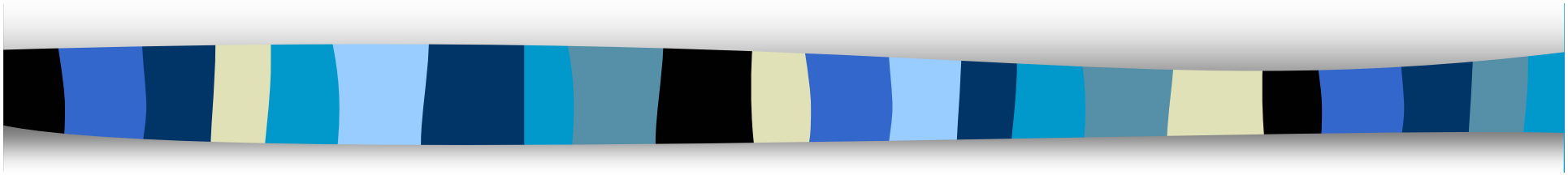


Monitoring: local skills & new technology

- Knowledge of local people with low/no literacy or numeracy poorly used;
- Cybertracker an example of a user-friendly system (www.cybertracker.org);
- Added advantage of involving resource users in developing management plans.



Step 4: Periodic Harvest Adjustments



Summary of the process & conclusions

SUMMARY: STEPS TO A MANAGEMENT PLAN

Inventory

How much of how much of the target species is present within the area?
(Resource density & population structure)
Is there a baseline for monitoring harvest impacts?

Yield & Regeneration Study

How much of the required product (quality & quantity) does the target species produce per unit time?
What is the regeneration rate of harvested populations / individuals?

Sustainable Harvest Protocol

How much of the target resource can be collected, how often / when, using what harvest method(s)?

Assessment and Periodic Monitoring of Harvest Impacts

What is the impact of the current harvest protocol on the target population and ecosystem?
Is the management action successful?

Periodic Harvest Adjustment

What adjustments can/should be made to allowed harvest protocols to maintain resource quantity & quality for future collection cycles & avoid unsustainable harvest?

PROGRESS & “BEST LAID PLANS”

- **Cameroon:** Detailed inventory & estimation of sustainable harvest only carried out on Mt. Cameroon (Acworth et al, 1998)…..no other inventory or management (Ingram, 2007)…but some project work (BHFP & Kilum-Ijum);
- **Madagascar:** Ministry of Environment, Water & Forests developed a National Plan of Action for sustainable production of *Prunus africana* (DGEF, 2003);
- Both plans based on the assumption that wild harvest of half the tree trunk bark (a quarter taken from opposite sides of the trunk) on a 5 year rotation would be sustainable…..but is this manageable (high value, weak tenure)?….or are agroforestry & plantations a better option?

DGEF. 2003. Plan d’action national pour la gestion durable du *Prunus africana*. Ministere de l’Environment, des Eaux et Forets. Direction Generale des Eaux et Forests. Comite National *Prunus africana*. Decembre, 2003.

REGULATION? WHAT REGULATION?

- **Cameroon:** *Prunus* harvest & export regulated as a 'Special Product' since 1994 through non-renewable, tonnage based permits are allocated by auction & quotas;

- **In theory:** linked to inventory and Management Plans. **In practice:** inventories done once only by projects (e.g. BHFP, Kilim-Ijim & Mount Cameroon);

- **Community Forest "Simple Management Plans (SMPs)" do not quantify *Prunus africana*.**

- **illegally harvested Prunus bark is auctioned at a public sale.** Buying price is usually below the current market price. The buyer, who does not have to have a special permit, pays the Treasury plus 12% of the buying price to the MINFoF Chief of Post who made the seizure.

Ref: Ingram & Nsawir, 2007

IS WILD HARVEST SUSTAINABLE?
Cameroon holds many lessons…

- **Demographic structure of natural stands shows very low representation of mature trees with dbh > 30cm, but very high exploitation rate reaching 80% of total individuals in some areas;**
- **Overexploitation rate is more than 90% in all studied villages: The minimum exploitable diameter is less than 10 cm and almost all individual with dbh >20 are totally debarked from buttresses to branches;**
- **Very few large trees in planted populations at present.**

Ref: ICRAF/IRAD/University of Dschang project results,
presented at the Bioversity International workshop, Ethiopia, 2008

CAMEROON: transition to planting?

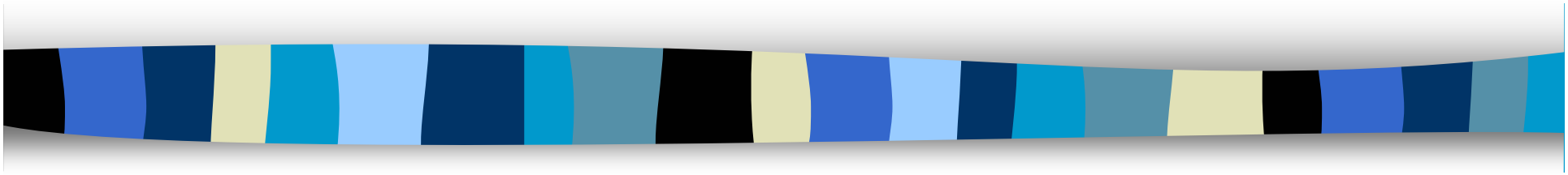
- **more than 94% of the population involved in the domestication but at least 90% of *Prunus africana* bark still exploited from the forest;**

- **45% of planting materia[illegible]or domestication are [illegible]ildings" collected from the neighboring forest, only 26% coming from nurseries;**

- **Populations are well informed about the sustainable exploitation practices but less than 10% of surveyed trees are sustainably exploited.**

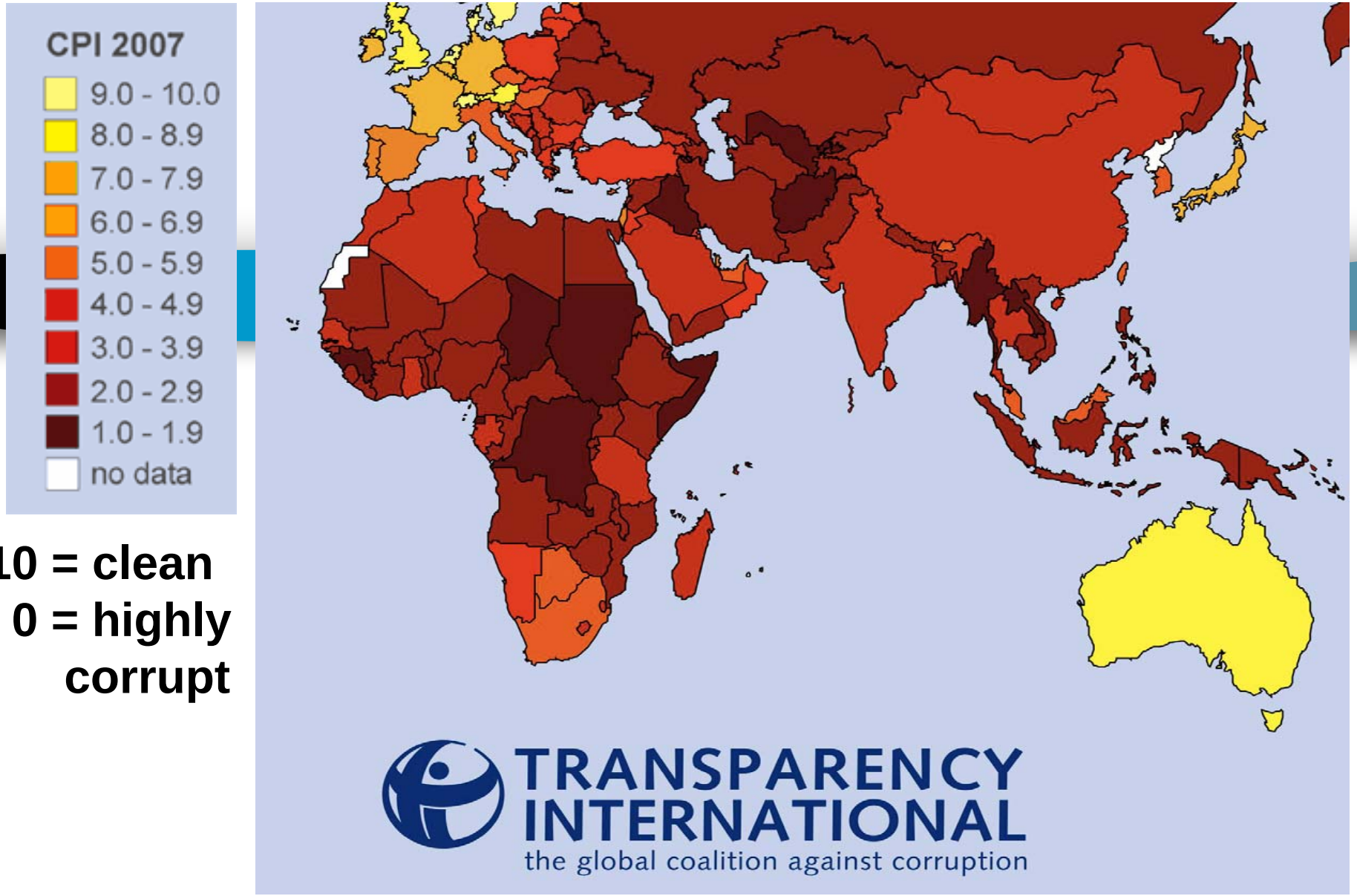
Ref: ICRAF/IRAD/University of Dschang project results,
presented at the Bioversity International workshop, Ethiopia, 2008

GOVERNANCE: WHY WORRY?



Intersecting factors outside the forest sector — political instability, corruption, agricultural trade liberalisation & infrastructure development—**have had a profound influence on forest governance & therefore on whether sustainably managed wild harvest is likely.**

GOOD GOVERNANCE IS CRUCIAL



10 = clean
0 = highly corrupt

FORESTS & COSTS OF CORRUPTION

- **Illegal logging costs governments at least US$10 billion in lost revenue globally (World Bank, 2002);**
- **Conflict & corruption in some cases results in lost development opportunities, minimising the real value of the forestry sector;**
- **The extent to which this applies to *Prunus africana* is unknown;**
- **What is known is that good governance is crucial for sustainable managed harvests & “fiscal forestry” for short-term gains has led to collapse of *P. africana* stocks.**

PRUNUS AFRICANA RANGE STATES: HOW DO THEY DO?

COUNTRY	RANK (out of 179) Denmark = 1 Somalia = 179	CPI Index* (2007)
DR Congo	168	1.9
Equatorial Guinea	168	1.9
Kenya	150	2.1
Nigeria	147	2.2
Cameroon	150	2.4
Burundi	131	2.5
Tanzania	94	3.2
Madagascar	94	3.2

*0 = highly corrupt, 10 = clean, based on multiple indicators

(see www.transparency.org)

WORSENING SITUATION…

- WHINCONET (2005); Ingram (2007)
- EU ban on importation from Cameroon (Nov 2007);
- **Future strategies:** planning for implementation - enterprises with smallholders (plus plantations?).

WHINCONET. 2005. Report On The Illegal Harvesting Of *Prunus africana* in the Kilum-Ijim Forests of Oku and Fundong, North West Province, Cameroon

Ingram, V. 2007. Problem analysis, assessment of impacts and status of the *Prunus africana* chain. Bamenda, November 22-23, 2007. SNV & CIFOR.

EU BAN: CLAIMS & CREDIBILITY…?

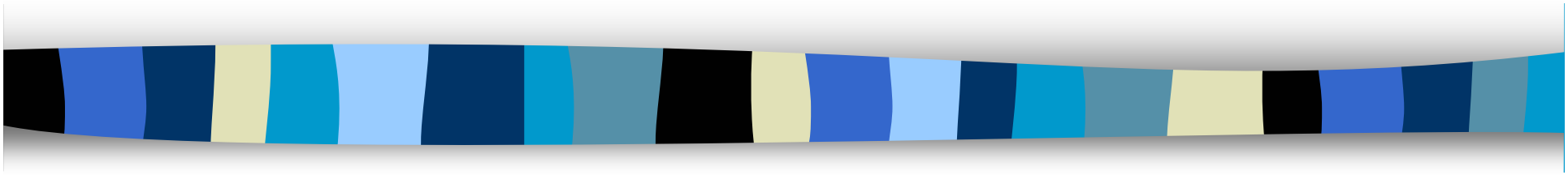
Letter from: Elvis Ngolle Ngolle, Minister, Ministry of Forestry and Wildlife, Republic of Cameroon, Yaoundé, 2 May 2007

"….I have the honour to once again reassure you as regards the sustainable management of forestry resources, an option chosen voluntarily by Cameroon, which of course also applies to Prunus africana…it is important to remember that the export quota of 2000 tonnes, adopted by Cameroon in 2005, was not fully exploited either in 2005 (1762.1 tonnes) or 2006 (1497.5 tonnes). This shows how willing we have been to restrict the harvesting of Prunus africana since the Conf. 12.8 (Rev.CoP13) Resolution was adopted. These efforts, along with the rigorous monitoring and strict control of harvests in situ, will continue…."

IS DEVOLUTION A SOLUTION?

- **Forest tenure reforms have swept across Africa, shifting from central to local government (decentralisation) & from government to the private sector and civil society (devolution);**
- **Devolution of powers to local bodies & authorities that are insufficiently trained or accountable without power to challenge & fine rule breakers has been a disaster;**
- **Community-managed *Prunus africana* harvest on Mt. Cameroon has not been successful, nor were traditional authorities able to stop exploitation in Oku.**

PLANNING OR PLANTING?



BARK HARVEST: GLOBAL PERSPECTIVE

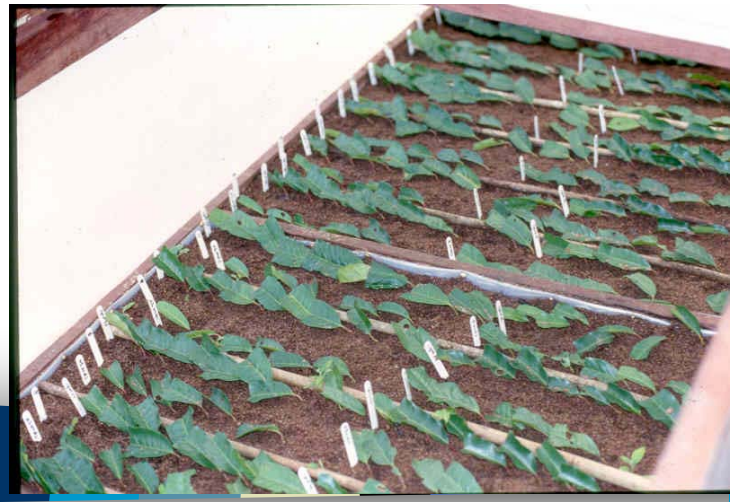
- **Wild harvest:** ***Prunus africana*** **bark is harvested in largest quantity of any tree species (3500 t/yr), followed by quillay (*Quillaja saponaria*, Rosaceae), exported from Chile (872 t/yr; 60000 [illegible]es/yr), also with hig[illegible]mpact on populations;**

- **Cultivation:**
  - **Cinnamon bark (7500 - 10000 t/yr);**
  - **Cassia (*Cinnamomum aromaticum*), 20000 - 25000 t/yr;**
  - **Cork (*Quercus suber*) bark (350000 t/yr)**
  - **Cinchona (8000-10000 t/yr)**
  - ***Schinopsis quebracho*** **(283000 t/yr).**

Cunningham, AB. in press. A review of the ethnobotany, use & sustainable harvest of bark. ***Advances in Economic Botany 47***

PLANTING IS THE FUTURE

- ***Prunus africana*** **can be successfully propagated by leafy cuttings using non-mist polypropagator;**



- **Leaf area, rooting hor[illegible]ne, rooting medium and d[illegible]ng's length have been identified as key factors affecting rooting ability of *P. africana* cuttings;**

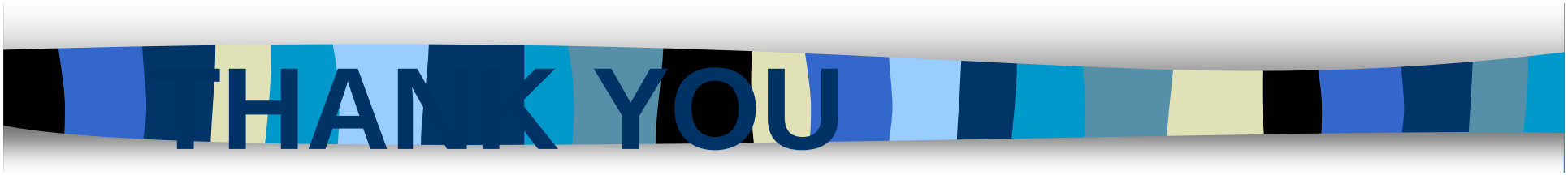
- **Treatment for optimum rooting has been identified (Tchoundjeu *et al*., 2002).**

Ref: ICRAF/IRAD/University of Dschang project results, presented at the Bioversity International workshop, Ethiopia, 2008

DOES IT PAY TO PLANT?

- While not as profitable as *Eucalyptus*, an alternative enterprise, farmers want to grow *P. africana;*
- Reasonably it is compatible with many crops and has multiple uses – bark sales, medicine, tools, poles, seed sales & mulch;
- NW Cameroon, 1996: several thousand farmers have planted the tree. The availability of markets also appears high, as herbal treatments of BPH are popular & demand is likely to grow.

Cunningham, A.B., Ayuk, E., Franzel, S., Duguma, B. & Asanga, C. 2002. An economic evaluation of medicinal tree cultivation: *Prunus africana* in Cameroon. People and Plants working paper 10. UNESCO.


THANK YOU