CITES PROJECT PROPOSAL

SECTION 1 - PROJECT IDENTIFICATION

1.1 Title of project: Development of a methodological framework, and practical guidelines for the estimation, implementation and monitoring of sustainable harvesting quotas for *Prunus africana* at a national scale.

1.2 Project number:

1.3 Geographic scope: Cameroon. The project will have relevance in all countries where a national quota for *Prunus africana* is required.

1.4 Implementation:

1. ONADEF (Office National de Développement des Forêts)
    CITES Scientific Authority in Cameroon (check!).

2. MINEF (Ministry of Environment & Forestry)
    CITES Management Authority in Cameroon.

3. Limbe Botanic Garden, and Biodiversity Conservation Centre,
    Technical unit of MINEF.

4. National Herbarium, Ministry of Scientific Research, Yaounde
    Technical Unit within the Ministry of Scientific Research & Technology responsible for botanical surveys and methodology development

5. School of Agricultural and Forest Sciences, University of Wales Bangor
    Recommended consultants

1.5 Duration of the Project: Twelve months, beginning as soon as funds are available

1.6 Cost of Project: USD$*53,298*

1.7 Project summary:

The Research aims to develop a methodological framework and practical guidelines for the estimation, implementation and monitoring of sustainable harvesting quotas for *Prunus africana* at a national scale. The resulting documentation will provide:

•   evaluation of the methodology and information required to determine an annual Prunus bark harvest and export quota;

•   a framework for the allocation, licensing, exploitation and monitoring of the harvest quota within localised production sites, that would ensure that the national quota is respected and possible adverse harvesting impacts are recognised.

SECTION 2 - BACKGROUND AND PROJECT CONTRIBUTION
TO OVERALL CITES IMPLEMENTATION

2.1 Background

Cameroon's Policy Background for the sustainable management of Special Forest Products

Recognizing the need to improve the sustainable management of its natural resources, in the early 1990s Cameroon started to make deep reforms in the forest sector. In 1994, the Government adopted a new Forestry Policy, which put new emphasis on sustainable management of forest resources, biodiversity conservation, and community participation.

This was converted into concrete legislation as the new Forestry Law[1] and its Decrees of Application[2]. This law demands a commitment to biodiversity conservation and sustained use of all forest resources, including Non-Timber Forest Products (NTFP).

Further, the National Forestry Action Plan (NFAP) presents specific strategies and actions from which the five key objectives of the above Forestry Policy can be better achieved. The present project proposal is in accordance with this logical framework and contributes to the attainment of objective 3 of the National Forestry Action Plan[3], which reads: *"Develop forest resources with a view to increasing the contribution of forest production in the GDP while conserving the production potential".*

During the 1990s, Cameroon also engaged a number of international donors in multilaterally funded Integrated Conservation & Development projects. These cover a number of sites of high biodiversity conservation priority, including three of the largest mountains in the Cameroon Dorsal Range. These are all home to *Prunus africana*, the subject of this project proposal.

More recently the Minister of Environment & Forestry put an Emergency Action Plan for the Forestry Sector in place in 1999 as an important outcome of the Yaoundé Forestry summit of the Central African Heads of State. This Emergency Action Plan specifically recognised the important contribution of *Prunus africana* to Cameroon's national and local economy, and the need to speed up efforts to manage and exploit the species sustainably (Nkuinkeu & Ndam 1999). In this context a national inventory has been launched, with co-financing from the Government and the international donors, and systems of management and control were devolved to communities in a pilot case on Mount Cameroon.

Background to the biology, utilisation and management of *Prunus africana*

Prunus africana grows in the montane forest regions of more than 20 African countries, including Cameroon. Mt. Cameroon supports the most important population of *P. africana* in Cameroon and in West Africa. Other mountains, such as Mt. Kupe, Mt. Oku, Tchabal Mbabo and all of the Bamenda Highlands have also been extensively exploited (ONADEF 2000).

P. africana bark is used locally and is the most important traditional medicine in the Mount Cameroon region (Jeanrenaud 1991). It is also the raw material for the pharmaceutical industry for the production of an extract used in the manufacture of a treatment for prostate disorders. If the bark is partially stripped according to prescribed norms (two quarter panels) it will regenerate and can reputedly be exploited repeatedly over 5 to 8 year intervals (Stewart 2000, Nkuinkeu & Vincent 1998, Cunningham and Mbenkum 1993), without killing the tree.

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[1]   Law N° 94/01 of 20 January 1994 to lay down Forestry, Wildlife and Fisheries Regulations.
[2]   Decree N° 95/531-PM of 23rd August 1995 to determine the conditions for the Implementation of the Forestry Regulations.
[3]   Specifically, outputs 3.3A.2/1 and 3.3A.3/1 through actions 3.3A.2/1.1, 3.3A.2/1.2, 3.3A2/1.3, 3.3A3/1.1, 3.3A.3/1.2, 3.3A.3/1.3 of Cameroon's National Forestry Action Plan.

In recent years, the extent and poor quality of exploitation and regeneration of the species in many parts of its afro-montane range has given rise to dramatic reductions in its population in exploited areas, and a proposal, submitted by Kenya, to include the species in CITES Appendix II was approved by the ninth meeting of the Conference of the Parties (1995, Harare, Zimbabwe).

All parties involved in the management and exploitation of the *P. africana* resource in Cameroon have been working together in an informal "working group" to improve the management of the species. This working group has recognised the opportunity to co-operate to ensure its sustained use, providing benefits to the Government, local communities, and exploitation companies alike as well as supplying an important international demand for a medicinal product. There is a widespread commitment in Cameroon to satisfy the legal requirements of Cameroonian law, and the CITES regulations, so that exploitation and trade can continue sustainably.

If adequate management measures are taken for the *in-situ* and *ex-situ* populations of *P. africana*, there is no reason why the species should not continue to be exploited and traded indefinitely. Presently, this objective is not being achieved fully and the resource remains seriously threatened in the areas of exploitation (Acworth *et al* 1998).

The montane forest which supports *P. africana* in Cameroon is also rapidly being degraded by farming and bush fire, suggesting that the natural population of Prunus is falling. However, at the same time, farmers have started to plant *P. africana* on their farms as a useful multi-purpose tree, with support from a wide range of organisations[4] (Nkuinkeu 1999, Ndam *et al*, 2000, ICRAF 1997).

Prunus africana is defined as a "Special Product" under Cameroon Forestry Law, and exploitation must be preceded by an inventory, the establishment of a sustainable quota, and the development of a Management Plan which includes procedures for resource exploitation, and renewal.

Consequently the Government of Cameroon needs to set quotas for the amount of bark, and hence the number of trees, which can be harvested each year from the various exploitation zones. One of the requirements of the Forestry Decrees (Article 87-88) is that "the Provincial Forestry Service shall provide a *reasoned recommendation* to the Minister in charge of Forests" regarding the suitability of the location, quantity and conditions of exploitation of the species concerned. This is very similar to CITES requirement that producer countries establish a "*scientific non-detriment finding*" for any annual quotas that are reported to CITES (Article IV, paragraph 2(a)).

Historically, the *"reasoned recommendation"*, and "*scientific non-detriment finding"* have been hard to establish, due to a deficit of even basic information about the species concerned and lack of field methodologies and a clear analytical framework to collect and analyse sufficiently accurate information to make informed management decisions.

CITES have recently prepared a draft manual to guide the determination of a scientific non-detriment finding (CITES 2000). The framework provided in the draft manual is an important starting point in the preparation of procedures to guide the implementation of sustainable management for an Appendix II listed species such as *Prunus africana*.

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[4]   e.g. Limbe Botanic Garden (with financial support from the Mount Cameroon Project), Plantecam (subsidiary of Groupe Fournier, the major international purchaser of Prunus africana bark), BirdLife International (who support community forestry initiatives throughout the Cameroon highlands, and ICRAF - the International Centre for Research in Agro-Forestry, who have chosen Prunus as a priority species, and Cameroon as a partner in domestication trials.

Certification of non-timber forest products is a rapidly growing area (Shanley *et al* in press). Although, at this point in time application for certification of *Prunus africana* from Cameroon is not being considered it is prudent to evaluate the management framework to be developed by the proposed project against existing non-timber forest product certification standards.

Inventory to estimate national stocks of *Prunus africana* in Cameroon

There are various parameters which enter into the calculation of the quota including the area of forest management units, proportion of trees which are exploitable, yield per tree, rate of recovery, etc. It is likely to be the estimate of Prunus population density that accounts for the greatest amount of uncertainty, as measured by statistical sampling error. Therefore effective and efficient inventory methods are a key factor to establishing a scientific non-detriment finding for a national quota.

Cameroon's Forestry Law obliges the exploiter to pay for pre-exploitation inventories. ONADEF, the organisation responsible for most of the forest inventory work in Cameroon, carried out an inventory of *P. africana* on Mount Cameroon in 1996, following the national standards for a 1% management inventory. The results of this inventory indicated widespread mortality of *P. africana* trees resulting from poor exploitation methods, and a future sustained yield of approximately 300 tonnes per annum from Mount Cameroon. These results persuaded the Ministry to dramatically reduce the quota in the exploiters' permit. Due in part to shortfalls in supply, Groupe Fournier, the main purchasers of bark in Cameroon closed their in-country processing facility and exploitation enterprise (Plantecam) in March 2000.

The tree density estimates obtained from the 1996 systematic strip-sampling inventory came under scrutiny and its reliability was questioned both by exploiters and forest managers. The main problem with this sampling plan is that *P. africana* tends not to be randomly distributed but is generally found aggregated into relatively sparse clusters.

After the disputes arising over the results of the 1996 inventory on Mount Cameroon, it was agreed with Cameroons' Ministry of Environment & Forestry that the future yield allocation should be on the basis of *Reliable Minimum Estimates* of the density of *P. africana* on Mount Cameroon, and not simply the *mean*, which inevitably has a wide statistical confidence limit, and high risks attached. This provides an important incentive to the exploiter to improve the precision of population estimates, while also considering the return on investment in inventory. There is clearly an optimum balance between cost and statistical efficiency, which must be found if sustainable management based on scientific principles is to be financially viable.

In 1999, a new inventory was proposed and tested on Mount Cameroon, applying an alternative sampling method, called adaptive cluster sampling (ACS), based on some fairly recent developments in statistical sampling theory (Thompson 1991 and 1992, Thompson and Seber 1996) and suggested for use with NTFPs by Wong (2000). This method, although based on randomly placed transects, enables entire clusters to be included in the sample when they are located. The available theory of ACS enables an unbiased estimate of density, and its sampling error, to be calculated from the data. The theory also suggests that when the population being estimated is highly aggregated, then the ACS estimate would be statistically more efficient (i.e. would have smaller standard error) than conventional strip transect sampling.

The results have been compared with conventional strip sampling to determine the relative efficiency and cost of the two methods. The fieldwork, undertaken by ONADEF working with MCP, was begun in November 1999, and the Statistical Services Centre of Reading University did statistical analysis of the data. This has resulted in some valuable preliminary results, but points to the need for further research into sampling methods (both in theory - through computer simulation of different methods, and in practice in the field) and development of

software to handle the analysis of more complex data sets (Underwood and Burns 2000). Some of the summary results showing the relative efficiency of the inventory method are presented in Annex 1 of this proposal.

For the national inventory of *P. africana*, further sites in Cameroon remain to be sampled. Results from a recent rapid assessment of these sites indicates that there are many small remnant patches of montane forest likely to contain some *P. africana* distributed mostly over the Western, North Western, Littoral, Centre and Adamaoua Provinces. The Ministry of Environment & Forests is moving ahead with the planning of a national inventory, which will be conducted by ONADEF, co-financed by international donors (GTZ and DFID), in addition to significant Government funding committed under Cameroon's Emergency Action Plan. It is expected that three new major sites will be inventoried during the year 2001. This provides an opportunity to refine the ACS methodology and provide the data necessary for a re-evaluation of the national Prunus bark quota.

The evolving framework for the Sustainable Management of *Prunus africana*

The development of a more sustainable system for the management and exploitation of Prunus in Cameroon has relied heavily on the simultaneous evolution of biological survey methods, and more transparent and equitable resource management and exploitation systems. These include:

- cost-effective and practical resource survey methods, yield estimation procedures to establish a national quota, and biological monitoring of the quality of exploitation and its longer term impact on the resource;

- improved licensing, exploitation, monitoring and control procedures, with a significant transfer of responsibilities and benefits to local communities, with the support of both commercial partners and Conservation & Development agencies (governmental and non-governmental);

It has been the combination of the improved biological information, and management systems that has resulted in the significant reduction of illegal, and unsustainable exploitation recently achieved in Cameroon. The project being proposed would systematically review and document these initiatives, drawing out lessons learned. These experiences could serve as guidelines for *Prunus africana* management planning outside Cameroon and also potentially for other species threatened by over-exploitation, both in Cameroon and further afield.

Quota estimation

The framework shown below in Table 1 will be used to guide the development of a quota for *Prunus africana*. This will be undertaken through a review of current literature and from experience in Cameroon and other producer countries. The result will be a set of recommendations for best practise to be adopted by the Government of Cameroon. The recommendations will outline the following:

- Standards for quantitative data to be used as the basis for the yield estimates. These will need to accommodate estimates based on the precautionary principle when detailed information is not yet available as well as laying out optimum standards were quantitative studies have been or can be undertaken.

- Recommended methodologies for developing estimates of the various components of the quota at national level.

- A series of recommendations for further research work to fill gaps in knowledge and to further develop improved / cost-effective methods for establishing valid estimates of yield.

The key factors required to establish a sustained yield estimate are listed below with the objectives of the research related to each factor of production.

Management System Development

Once the quota and norms for inventory and exploitation have been established, it is vital that the government ensures that they are respected. The experience in Cameroon illustrates clearly the need to develop a decentralised management and monitoring system, that maximises the sense of responsibility of the exploiters and local forest managers to respect the defined quotas, rules and regulations. Participation of local communities in exploitation and management has been key to achieving these increased levels of responsibility.

The resulting resource management system must be transparent, with clear monitoring and control mechanisms that ensure that the authorities at each level are responsive to failures to meet the agreed standards, and sanction defaulters at each stage of the exploitation and commercialisation process.

The following framework for management is envisaged, though it requires further development and agreement before it can become fully effective in Cameroon. It is hoped that the proposed project will serve as an impetus for such development and institutionalisation by the authorities in Cameroon within the context of the Cameroon Laws.

2.2 Project contribution to the overall implementation of CITES objectives

The project partners wish to contribute to the development of a comprehensive planning, research and management framework for establishing and implementing nation-wide quotas of species threatened by exploitation and trade. *Prunus africana* in Cameroon will be treated as a test case used to develop and illustrate the framework, and methods for developing a scientifically defensible national quota, and implementing a management system that ensures that these quotas are respected.

We believe that this proposal fits with the objectives and ongoing efforts of CITES to encourage the improved management of all CITES listed species, and helps parties to CITES to comply with the provisions of Article IV of the convention and avoid the implementation of Resolution Conf. 8.9 (Rev.) on trade in wild specimens. In particular the project would be in a position to test the framework for the determination of a scientific non-detriment finding laid out in the draft manual (CITES 2000), see Table 3 below for the extent to which this framework could be quantified using the information garnered by the proposed project.

Table 1. Draft framework for biological studies to establish sustained yield estimates

Factor of Sustained Yield Estimate	Minimum standards required	Ongoing Research Objective
Exploitable area and management strata.	Map showing known range of species, and identifying the sites under management and exploitation. Where possible these areas should be sub-divided into management strata, where more information on localised population density is available	Explore how remote sensing methods can be combined with existing knowledge of populations, both to estimate total area of natural range, and to assist with the stratification of forest areas for inventory and management. Where RS data is absent, propose statistical methods to estimate the geographical extent of species occurrence.
Density of productive trees (excluding dead or over-exploited trees).	Inventories should be of sufficient intensity to ensure that the results are within acceptable confidence limits. This inventory must be prepared by a professional body independent of the licensee. The results should be reviewed by the newly appointed Scientific Authority and recommended for approval to the Management Authority. Inventories adequate for reviewing and revising Forest Management Plans should be repeated at least every 5 years.	Reliable Minimum Estimate (RME = mean - 1-tailed 90% confidence limit) of population density based on a sound sampling methodology should be used for establishment of quotas; Test, compare, and document innovative sampling designs that are cost-efficient and suitable for inventories of single, clumped species such as *Prunus africana*.
Tree health	Estimate the proportion of the population that is healthy based on crown condition scoring or other accepted indicators of tree health.	Carry out research into the physiological effects of (repeated) bark removal on the long-term health of *Prunus africana* trees.
Best method and frequency of exploitation	There is debate on the best method of exploitation of Prunus (either minimum exploitable diameters for felling, or partially debark tree in a temporal cycle). For non-destructive harvesting methods, estimate the frequency and extent of exploitation possible that allows full recovery of the tree between harvests.	Extend the study on tree health to look at the effects of repeated bark removal from different sites, size classes and debarking methods. This work is being carried out in Cameroon by the Natural History Museum, Paris, in collaboration with, and funding from, industry (and CITES?).
Recruitment, mortality, & growth rates of *P. africana*	Where exploitation results in increased levels of mortality of productive trees, develop population model to determine the long-term impact of exploitation on population structure and regeneration.	Use existing inventory data and establish long term monitoring plots to determine the population dynamics of *Prunus africana* under different management regimes.
Provenance and Yield per tree	Determine average yields per size class from accepted exploitation methodology (destructive or non-destructive) and apply to yield estimates for each of the different sites (at which *P. africana* displays significantly different growth habit, probably due to a combination of climatic & edaphic conditions, and possibly genetic difference between populations)	Carry out controlled exploitation of *Prunus africana* to assess the relationship between yield and tree size (and method/frequency of harvest), for each site.
Yield per exploitation Zone / management unit.	National estimates should be the sum of the yield estimates by managed unit. A management plan should be prepared and approved by the appropriate authorities, and evidence (e.g. from periodic independent monitoring) of its effective implementation should be given for each area under exploitation.	From the above factors, develop a method to calculate a "Reliable Minimum Estimate" of yield for *Prunus africana* both for local management units, and determine how these can be built up into a national quota.
Cost of sustainable management	The costs and responsibilities for management need to be carefully assessed to ensure that the management system is sustainable and the product is competitive on the world market. A major problem is that the management costs make the resulting bark much more expensive than unsustainably exploited bark.	From the above work, calculate the estimated cost of achieving sustainable management in comparison with the value of the product, and other costs of production. The overall aim must be to deliver a system that is efficient and economically viable for dissemination to other situations.

Table 2. Sustainable Management System

Factor of Sustainable Management System	Minimum standards required	Ongoing objectives for improvement of management standards
Financing of Resource Inventory.	The need to establish yield estimates before the issuing of permits may require that the Government pre-finances resource inventories and drafting of management plans prior to the exploitation permit being allocated. Ultimately the exploiter should re-fund the investment as part of the exploitation contract.	The mechanisms for implementing this procedure in Cameroon are under development within the context of its Special Fund for Forestry, into which part of the taxes payable by forest exploiters are put. There is a good opportunity to utilise such funds to pay for inventories and other management tasks.
Agree standard units for issuing quotas, reporting and monitoring of trade of *P. africana* bark and derivatives	Exploiting and exporting agents should be obliged to declare exploitation and export quantities and quote them in standard units (e.g. kg raw product equivalent at a given percentage moisture content).	Monitoring trade of *Prunus africana* is complicated by the fact that it is exported in many different forms, ranging from concentrated extract to chipped raw bark. Even for raw bark, moisture contents vary by up to 50% and weights quoted without form or moisture content can therefore be misleading.
Develop simple templates for Management Plans and Exploitation Contracts.	From the inventory data and results, and agreements with all local partners, draft a simple plan for the management and exploitation of the *Prunus africana* resource. This management plan is a legal requirement and forms the basis for monitoring, of off-take, and compliance with the rules and regulations in contract.	Provide a model (template) management plan, and an exploitation contract for *Prunus africana*, showing how the basic principles of good management can be incorporated into the plan, and simple rules and regulations regarding the exploitation of Prunus can be achieved.
Involve local community in management and exploitation	One of the major causes of poor management in Cameroon has been the failure to adequately involve the local community in the sustainable exploitation of P. africana, and benefit sharing. This has resulted in them having either no interest in controlling outside exploitation, or worse, conniving with outside exploiters in illegal or unsustainable exploitation for small benefits.	Review and document best practise for involving local communities in such a way as to ensure their full support for the proper management of the *Prunus africana* resource.
Allocate Exploitation Permits in rational and transparent manner.	Exploitation permits should be allocated for defined areas, and on the basis of adequate yield estimation (as outlined above). The permits must establish contractual obligations to respect the management plan. This should cover exploitation methods, quotas, and benefit sharing mechanisms with clearly defined procedures for sanctioning failures to do so.	Presently, Cameroon's permits are issued centrally, on the basis of a technical assessment from the Provincial Delegation of Forestry. A working group made up of government officials, private enterprise & Community Based Organisations will determine how the procedure of issuing permits can ensure local involvement in management, benefit sharing and control of illegal exploitation
Record harvest off-take in standard units	A record-keeping system, using standard units of measure, that allows all harvested bark to be traced to a particular licensed exploiter, in a specific managed forest, and possibly to the specific tree and the harvester, to monitor the respect of quota. Exploiters should record the size and yield from each tree. This will provide a more accurate estimate of actual yields per tree.	As with timber licences, Cameroon exploitation procedures (Cahier des charges) requires regular recording and reporting of off-take to the authorities, but this has rarely been implemented for *P. africana*, due largely to the perceived difficulties of implementing the system. In the Mount Cameroon region a tree tagging system has been implemented. Tree numbers are then transferred to tags for each bundle of bark exploited. Records are kept and compiled regularly. This system will be further developed for wider application, so that tag numbers relate

Factor of Sustainable Management System	Minimum standards required	Ongoing objectives for improvement of management standards
		to a specific licence and the individual exploiter, and be traceable to the point of export.
Establish local monitoring teams	Monitoring needs to be regular and unbiased. Ideally it should include representatives of the exploiter, the local community, and the forestry service, and follow a standard methodology	Joint monitoring by mixed teams creates transparency and mutual sense of responsibility to ensure that exploitation is done following agreed procedures.
Regular Monitoring programme by Management Authority	The Management Authority should conduct regular (at least annual) monitoring of all exploitation permit zones to ensure that harvesting is being implemented according to the norms. A review of the previous years' exploitation in terms of quantity and observation of the detailed technical clauses in the Licence, should be done before allowing further exploitation	
Establish effective control mechanisms to limit illegal exploitation	Joint Control mechanisms whereby communities, individuals and MINEF are all informed of any legal permits for exploitation and their conditions, and have the right to report any failures to respect rules and regulations in return for benefits.	A joint control mechanism has been implemented in the Mount Cameroon region have been instrumental in improving the frequency of reporting and the more effective control of illegal exploitation. This system will be further developed in the anticipation that it will be endorsed at national level, and serve as a model to be adopted elsewhere..
Develop simple methods and guides for the identification of Prunus and its derivatives.	The Management Authority and Customs officials monitoring exports should be trained in the identification of endangered plant species and their derivatives and be expected to record all trade in detail.	Simple guides shall be produced for the identification of *P. africana* and its derivatives, and a training program designed for Customs and Forestry officials [n.b. implementation may require additional funding].

SECTION 3 - NEEDS AND RESULTS

3.1 Needs

There is an urgent need to establish some basic guidelines by which a producer country can establish a **scientific non-detriment finding for national *Prunus africana* quotas**. It is hoped that this case study will illustrate the methodology, which could be adapted and applied to other producer countries, and possibly species.

3.2 Results

The results will be fourfold:

- estimates of a series of site by site quotas for *Prunus africana* for Cameroon resulting from the implementation of the methods and procedures described by the framework. Demonstration of the method will illustrate how a "national quota" can be established;

- a "Manual of Procedures" which provides minimum standards and comprehensive advice on appropriate methodologies for each step towards determining a national quota for *Prunus africana*;

- recommendations for the management and conservation of *Prunus africana* populations *in situ* and *ex situ*;

- a test of the CITES draft framework for establishing a non-detriment finding.

3.3 Assumptions to achieve results

- Suitable counterparts within ONADEF are available for training and implementation;

- The national Prunus inventory is completed and results are satisfactory;

- Cameroon authorities provide adequate assistance to develop and officially endorse the Manual of Procedures and guidelines for sustainable *Prunus africana* management.

- Cameroonian authorities will implement recommendations resulting from the study.

It is important that the donors understand and accept that not all aspects of the framework for quota setting can be completed as part of this project. However, the process of outlining the expected standards will provide a valuable planning tool to guide ongoing research work and for the Government to review progress towards effective quota setting and management.

Table 3 – CITES framework to make a non detriment finding (Table 2 in draft manual)

Information required	Remark
Biological characteristics (plants)	
2.1 Life form	Known
2.2 Regeneration potential	Some information - several studies in progress
2.3 Dispersal efficiency	Assessment possible
2.4 Habitat	Known
National status	
2.5 National distribution	Known
2.6 National abundance	Known when national inventory completed
2.7 National population trend	Assessment possible?
2.8 Quality of information	Quantitative with error determination
2.9 Major threats	Known?
Harvest management	
2.10 Illegal off-take or trade	Assessment possible ?
2.11 Management history	Known - require review of impact of past management practices
2.12 Management plan or equivilent	Report will inform management plan - ONADEF committed to preparation of plan
2.13 Aim of harvest regime in management planning	Sustainable yield, livelihoods
2.14 Quotas	Determined by proposed project
Control of harvest	
2.15 Harvesting in protected areas	Assessment possible
2.16 Harvesting in areas with strong resource tenure or ownership	Assessment possible
2.17 Harvesting in areas with open access	Assessment possible
2.18 Confidence in harvest management	?
Monitoring of harvesting	
2.19 Methods used to monitor the harvest	Need to be developed - presently based on market/export records
2.20 Confidence in harvest monitoring	Unknown
Incentives and benefits from harvesting	
2.21 Utilisation compared to other threats	Assessment possible?
2.22 Incentives for species conservation	Ex-situ planting commenced
2.23 Incentives for habitat conservation	Watershed Protection, Conservation payments.
Protection from harvest	
2.24 Proportion strictly protected	Assessment possible
2.25 Effectiveness of strict protection measures	??
2.26 Regulation of harvest effort	??

SECTION 4 - OUTPUT, ACTIVITIES, WORKPLAN AND TIMETABLE, BUDGET, FOLLOW UP

4.1 Output

The major product will take the form of a "Manual of Procedures" which provides minimum standards and comprehensive advice on appropriate methodologies for each step towards developing a national quota and guidelines for best practice for sustainable management of the *P. africana* resource in Cameroon.

It is expected that the process of developing the framework will serve as valuable training for key staff from relevant institutions and build up the capacity to implement recommendations relating to quota setting, management and monitoring of exploited wild plants.

A report detailing the findings for *P. africana* in Cameroon resulting from applicaton of the suggested framework will be prepared. This will illustrate how Cameroon is attempting to develop sustainable management systebms and procedures for a species threatened by over-exploitation in the wild.

A comprehensive report (in English and French) to Cameroon's Scientific and Management Authorities for CITES, and to the CITES International Secretariat describing practical approaches for the development of a national exploitation quota for *P. africana*, and its effective implementation and control. This report will also explain how the project was implemented and the Manual developed.

Beneficiaries of the project would be:

- All those with an interest in sustainable *Prunus africana* production in Cameroon, including ONADEF, MINEF, local buyers and communities and individuals who derive an income from collection and sale of Prunus bark and timber.

- Those reliant on international trade in *Prunus* bark for continued access to an effective drug for the treatment of Benign Prostatic Hyperplasia.

- International buyers (countries which import *P. africana*, e.g. France, Spain, Italy, Germany), producers (countries which export *P. africana*, e.g. Equatorial Guinea, Kenya, Madagascar, Cameroon, Democratic Republic of Congo, etc.) and conservation donors and implementers (e.g. DFID, GTZ, WWF, ICRAF, etc).

- CITES scientific and management authorities in *Prunus africana* range countries.

- CITES working group developing the draft manual for scientific non-detriment findings.

4.2 Activities

i. Further elaboration of the steps involved in the fulfillment of the framework laid out in Tables 1 and 2 above. The intention is that the framework should be developed in such a way that it could potentially be developed into a **generic framework** that can be applied more widely to a range of non-timber forest products.

ii. Each of the steps (outlined in the framework) required to establish a quota estimate will be reviewed by a panel of national and international experts and government officials to agree on basic principles, minimum standards and recommended best practice. The framework will be harmonised as far as possible with the CITES draft manual for determination of a non-detriment finding and relevant international certification standards.

iii. The framework and standards will be reviewed and endorsed by the Management and Scientific Authorities for CITES in Cameroon (MINEF and ONADEF respectively), with support and advice from other experts.

iv. Detailed assessment of existing information on *Prunus africana* against the agreed framework and standards. Preparation of a report detailing the findings for Prunus and outlining the action necessary to fill remaining gaps.

v. Preparation of a manual of procedures for *Prunus africana* management planning using the agreed framework.

Associated on-going work

▪ The on-going national inventory of *Prunus africana* being financed by Cameroon's Ministry of Environment & Forestry and international conservation donors (particularly GTZ and DfID). At the end of this inventory, the results and methods will be assessed for their efficiency and practicality, and a manual of procedures will be prepared.

▪ On-going research being carried out by the Natural History Museum of Paris, into the physiological impacts of repeated bark exploitation supported by Groupe Fournier (and CITES?).

▪ Provenance differences being undertaken as part of Daniel Pouakouyou's PhD research on *Prunus africana*.

▪ The *Prunus africana* monograph recently completed at the University of Wales, Bangor (Hall, O'Brien and Sinclair in prep.).

▪ Funds are being sought to establish long term monitoring plots at a series of sites in Cameroon to monitor growth, mortality, regeneration and the impacts of bark stripping over time.

It is hoped that the results of on-going work on *Prunus africana* being funded by other donors listed under section 4.2 will be available to feed into this CITES funded project, with no additional costs to CITES.

Methodology

The project is envisaged as a process of consultation, based on compiling information on accepted best practice, and presenting this to the various scientific and administrative authorities for adoption and approval.

This work will be done largely in Cameroon, and will focus on getting the nation's experts together in a **scientific working group** to formulate the framework, and methods.

This will be done in a series of steps, outlined below:

1. **Review methods** for obtaining statistically valid information relating to the setting of quotas as outlined in the framework in Table 1, above. This will be based on a **literature review**, and a **questionnaire / survey** of practitioners attempting similar exercises with other endangered plant species world-wide. This may need to be done out of Cameroon, as much of the literature is not available in country.

2. **Assess field experience** in the implementation of the various methods proposed and extract **lessons learned** and **best practice**.

3. **Identify areas where further work is required** to develop and test the recommended framework and methods. This may involve more **theoretical work** as well as more **field testing to prove their efficiency and practicality** of recommendations on the ground. In particular it may be necessary to field test recommendations for community based monitoring activities.

4. The **scientific working group** would then **submit this framework for approval** by the CITES Management and Scientific Authorities in Cameroon **for its implementation** for *Prunus africana*.

5. Finally, the **results will be written up** in a report for peer review and wider dissemination.

4.3 Workplan and timetable

Activity	Duration	Responsible	Timing (indicative)
Review of research methods in literature.	4 weeks	International Consultant, with Cameroonian counterpart, in UK?	Oct-Dec 2001
Review of best practice and field experience. Questionnaire by email and post to practitioners in the field.	4 weeks	International Consultant, with Cameroonian counterpart, in Cameroon and the UK.	Oct-Dec 2001
Drafting of Manual of Procedures.	4 weeks	Panel of national & inter-national experts in Cameroon.	Jan-Mar 2002
Approval by the Scientific and Management Authorities in Cameroon	2 weeks	Panel of Management & Scientific Authority, with technical advice from CITES	Apr-May 2002
Preparation of final report for publication:	4 weeks	Panel of national & inter-national experts in Cameroon.	Jun-Jul 2002

4.4 Budget

See attached budget.

Cash advance requirements

50% of the funds are needed in advance of project implementation. Funds for publication and distribution of the final report, and final installments of consultant fees can be held back until completion of all tasks in terms-of-reference and publication of final report.

Follow up

The report should be subjected to peer review and subsequently submitted to CITES Plants Committee. ONADEF and MINEF are responsible for considering recommendations made by the project and implementing those that are agreed to be important.

At the end of this project, it may be appropriate to host an international workshop on the sustainable management of *Prunus africana*, to which are invited representatives from the CITES management and scientific authorities from all producer and consumer countries, pharmaceutical industries, and other interested parties. This, would however, require significant additional funding beyond the present proposal.

SECTION 5 - INSTITUTIONAL FRAMEWORK AND EVALUATION

5.1 Institutional Framework

This project will be implemented by a steering committee made up of representatives of the implementing instiutions (ONADEF, MINEF, LBG-BCC and the National Herbarium). An international consultant provided by the University of Wales, Bangor, with a Cameroonian counterpart approved by the CITES Scientific and Management Authority of Cameroon (ONADEF and MINEF) will be directed by and report to the steering committee and will undertake the literature review and drafting of recommendations and reports.

5.2 Evaluation

Evaluation of the research findings and conclusions will be made during peer review process.

SECTION 6 - MONITORING AND REPORTING

6.1 Progress reports will be submitted every 3 months, specifically reporting the development of the framework and outlining interim results of analyses.

6.2 Terminal reports Final report to be completed within three months of completion of the work.

6.3 Financial reports Interim report due within two weeks of completion of specific items on the work programme. Final financial report due within two weeks of acceptance of final report by funding agencies.

6.4 Terms and Conditions

6.4.1 Non-expendable equipment: Any equipment purchased by the project is to be donated to counterpart organizations after the project with the provision that it be made available to future CITES projects.

6.4.2 Responsibility for cost over-runs: MINEF (CITES Scientific Authority) will be responsible for financing the costs of any expenditures of its staff (including ONADEF staff) that are not covered in this budget.

7. Literature references

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Relative efficiency of ACS estimates (extracted from Underwood F.M. and R.W. Burn, 2000)

Table 1 - ACS estimates of *P. africana* density by stratum compared with strip estimates

Stratum	Transects	Area (ha)	ACS estimate	ACS variance	Strip estimate	Strip variance
1	1,2,3	1325	7.33	3.45	10.47	15.75
2	4,5	1584	4.67	4.14	4.90	6.58
3	6,7	1575	0.14	0.02	0.14	0.02
4	8,9,10	1449	5.86	3.58	6.66	10.84
8	29,30,31	3082	4.74	0.41	3.77	0.70
	Overall:	9015	4.48	0.34	4.78	0.91

95% confidence interval   - ACS: 3.34 – 5.63 trees/ha

- Strip: 2.92 – 6.65 trees/ha

The relative efficiency of ACS to conventional strip sampling is the ratio of the overall variances, 2.64. This can be interpreted as meaning that the precision of ACS sampling is better than strip sampling by a factor of 2.64.

Estimate of Total Number of Trees

Excluding the exceptionally sparse area covered by stratum 3, the estimate of number of trees (with dbh > 10 cm) is calculated as follows:

Total area sampled = 12,152 ha

Estimated density of trees > 10cm dbh =   4.27 trees/ha, with 95% confidence limits of 2.89, 5.66 trees/ha.

Estimated total = 51,912 trees, with 95% confidence limits 35,085 - 68,739 trees.

3.2 Cost effectiveness of ACS

The improvement in relative statistical efficiency of ACS, as discussed above, is a measure of the precision of the method compared with conventional sampling methods. However, this gain in efficiency has a cost. It is clear from the description of the method that the field work for ACS is more demanding than conventional strip transect sampling. On the other hand, because ACS tends to sample a greater number of trees, because entire clusters are observed, there is an additional gain in terms of more information. This is an added bonus over and above the gain in precision. Table 3 below summarises the additional information in terms of number of plots and number of trees.

Table 2 - Numbers of plots and trees sampled with ACS and strip sampling

Stratum	Transects	ACS		Strip	
		Plots	Trees	Plots	Trees
1	1,2,3	194	582	75	157
2	4,5	95	153	48	47
3	6,7	74	2	70	2
4	8,9,10	148	258	63	84
8	29,30,31	478	911	138	104
	Overall:	989	1906	394	394

The ACS/Strip ratio is 2.51 for number of plots, and 4.84 for number of trees. So almost five times as many trees were observed with ACS as would have been observed with strip sampling.

Estimates of comparative costs of ACS versus strip sampling were obtained from estimates of the number of man-days required to sample a plot. The results are summarised in Table 4.

Table 3 - Estimated field costs in man-days for ACS and strip sampling

	Cost per plot	ACS		Strip	
	Man days	Plots	Cost	Plots	Cost
Plot on Transect	1.90	394	749	394	749
Additional Plot	0.69	595	411	-	-
Total		989	1159	394	749

From these results, it is possible to calculate the equivalent sampling effort required with strip sampling to produce the same precision as was obtained with ACS. The number of plots that would have to be sampled is 1039, and the cost would be 1973 man-days. This compares with 1159 for ACS and would amount to an increase of 70% in cost.

Revised Budget

		CITES	DRAFT BUDGET FOR CITES PROJECT PROPOSAL				
		Project: Development of framework for development of national quotas for endangered species				Exchange Rate: Fcfa/USD	
				Daily Rate	No. of days		700
Activity / Budget Line No.			No.	US $		US $	Fcfa
	1	**Review research methods and best practice in literature.**					
1.1		International Consultant (+ 3 days of 2nd international expert)	1	**375**	15	5,625	3,937,500
1.2		Cameroonian counterpart (honorarium in the UK)	1	**100**	15	1,500	1,050,000
1.3		Cameroonian counterpart (perdiem in the UK)	1	**60**	15	900	630,000
1.4		Travel allowance to-from Cameroon-UK	1	**2,000**	1	2,000	1,400,000
						–	–
	2	**Review best practice and field experience. Questionnaire by email and post to field practitioners.**				–	–
		Prepare & distribute questionnaire while in UK. Cameroon Counterpart distributes on return to Cameroon.					
2.1		International Consultant based in UK	1	**375**	4	1,500	1,050,000
2.2		Cameroonian counterpart based in UK (honorarium)	1	**100**	4	400	280,000
2.3		Cameroonian counterpart (perdiem in the UK)	1	**60**	15	900	630,000
2.4		Travel allowance to-from UK-Cameroon	1	**2,000**	1	2,000	1,400,000
		Compile and analyse results of questionnaire (done part in UK, completed in Cameroon)					–
2.5		International Consultant (+ 2 days of 2nd international expert in UK)	1	**375**	6	2,250	1,575,000
2.6		Subsistence for International consultant (2 days in Cameroon)	1	115	2	230	161,000
2.7		Cameroonian counterpart based at home (honorarium)	1	**100**	4	400	280,000
						–	–
	3	**Prepare Draft Manual of Procedures.**				–	–
3.1		Rent of Limbe Botanic Garden Seminar Room	1	**100**	5	500	350,000
		Honorarium and Night allowance for staff					–
3.2		ONADEF Staff	3	60	5	900	630,000
3.3		MINEF Staff	3	60	5	900	630,000
3.4		LBG Staff	2	30	5	300	210,000
3.5		International Consultant.	1	**375**	5	1,875	1,312,500
3.7		Subsistence for International consultant	1	115	5	575	402,500
3.8		Cameroon Counterpart	1	100	5	500	350,000
3.9		Lunch & Breaks for 10 staff for 15 days	10	10	5	500	350,000
3.10		Local transport, 1 vehicle to remain with team	1	80	5	400	280,000
	4	**Obtain approval by the Scientific and Management Authorities in Cameroon**				–	–
4.1		Rent of Conference Room in Yaounde	1	**100**	3	300	210,000
		Honorarium and Night allowance for staff				–	
4.2		ONADEF Staff	3	30	3	270	189,000
4.3		MINEF Staff	3	30	3	270	189,000
4.4		LBG Staff	2	60	3	360	252,000
4.5		International Consultant	1	**375**	3	1,125	787,500
4.6		Subsistence for International consultant	1	115	3	345	241,500
4.7		Cameroon Counterpart	1	100	3	300	210,000
		Lunch & Breaks for 10 staff for 5 days	10	10	3	300	210,000
4.8		*Travel for invitees, and transport*				–	–
4.9		Travel allowance for national invitees	8	30	3	720	504,000
4.10		Local transport, 1 vehicle to remain with team	3	80	3	720	504,000
	6	**Prepare final report for publication:**				–	–
6.1		International Consultant	1	**375**	3	1,125	787,500
6.2		Cameroon Counterpart	1	160	3	480	336,000
6.3		Subsistence for International consultant	1	150	3	450	315,000
						–	–
	7	**Supervision, Co-ordination and other Overheads**					
7.1		Limbe Botanic Garden Project Co-ordinator (2 months.)	1	**100**	30	3,000	2,100,000
7.2		Secretary (1 month) administration, workshop organisation, report typing.	1	**60**	15	900	630,000
7.3		Communications (phone, fax, postage charges during project)	1	**500**	1	500	350,000
7.4		Translation services - for final report	1	150	5	750	525,000
7.5		Printing and distribution of final report	100	**20**	1	2,000	1,400,000
				Sub-total		38,070	26,649,000
	8	**Limbe Botanic Garden Overhead charge**	35%			13,325	9,327,150
		Miscellaneous (refundable if not spent) @	5%			1,904	1,332,450
				GRAND TOTAL		*53,298*	*27,981,450*