Perspectives for sustainable *Prunus africana* production and trade

State of knowledge on *Prunus africana* policy and practice

June 2015

Verina Ingram[a, b], Judy Loo[c], Ian Dawson[d], Barbara Vinceti[c], Jérôme Duminil[c], Alice Muchugi[d], Abdon Awono[b], Ebenezar Asaah[d]

Science to support policy decisions

This brief documents current knowledge about pygeum (*Prunus africana)*. It aims to inform decision makers in governments in producing and consumer countries, international and civil society organisations and researchers, about sustainable (international) trade and governance of the species.

Methods

The information presented in this brief includes current best practices, experiences from fieldwork by the CGIAR centres, and insights from data published in the last decade. Recommendations are made cautiously, bearing in mind its many uses, different types of national and international trade and differing national regulations and contexts. A long-term perspective also is needed due to the long time frame involved in managing the tree, and time lags before impacts on the species and on livelihoods are evident for those involved in its trade.

Trade and regulatory history

Concerns about the impacts of trade and regulation (see box right) have led to:

- IUCN Red Data Listing of pygeum as vulnerable since 1998, although the listing is recognised as needing updating.
- Listing since 1995 on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This means that the species is seen as not necessarily now threatened with extinction but may become so unless trade is closely controlled through annual quotas. Legally binding on government parties, CITES does not replace national laws but provides a framework for implementation in national legislation. Since 2007, the only countries with export quotas have been Cameroon, Uganda and DR Congo. Small quantities have been exported from Madagascar, Tanzania and the Republic of Congo (10).
- Despite support from a CITES Working group in Naivasha in 2008 (84, 93) and two CITES-ITTO projects from 2008 to

Pygeum: A multiple-use tree

Pygeum (*Prunus africana*) is a long-lived tree species native to mostly mountain tropical forests in sub-Saharan Africa. It is also known as red stinkwood, iron wood, African plum, African prune, African cherry, and bitter almond, as well as having many names in local languages. It occurs in the wild generally 800 metres above sea level and higher, and has been described in 22 countries in Central, East and Southern Africa. Pygeum's hard, durable wood is used for axe handles, poles, carving and fuelwood; it is an important tree for bees and honey yields; the bark and seeds are used in traditional medicine for genito-urinary complaints, allergies, inflammation, kidney disease, malaria, stomach ache, fever and for veterinary remedies. The bark, peeled off the tree, dried and chipped or powdered, is used to make an extract included in treatments for benign prostatic hyperplasia, a non-cancerous glandular disorder affecting men mainly over forty.

Concerns

Fears have been expressed about the international trade in pygeum bark and ensuring secure, sustainable supplies for the following reasons:

- Habitat loss of mountain forests, the areas where pygeum naturally occurs, has been generally high. Fragmentation, deforestation and degradation (1-3) affect the genetic structure of pygeum populations (6) and decreased biodviersity affects pygeum seed dispersal (6,31, 32,34,35), in turn affecting pygeum populations.
- Climate change is affecting mountain forests, with a predicted -45% net loss in suitable habitat in 2050 compared to 2010 (7, 9). High losses of over 30% are predicted in DR Congo, Tanzania, Cameroon, Madagascar, Uganda and Kenya (1).
- There is continued demand for pygeum bark in international pharmaceutical and herbal products.
- Uncertainty about the most scientifically robust, cost-effective and appropriate policies and regulations to control harvesting, develop inventories and management plans, and regulate international trade (13, 39, 40, 60).

date, many exporting countries have difficulties to meet CITES requirements (11, 12).

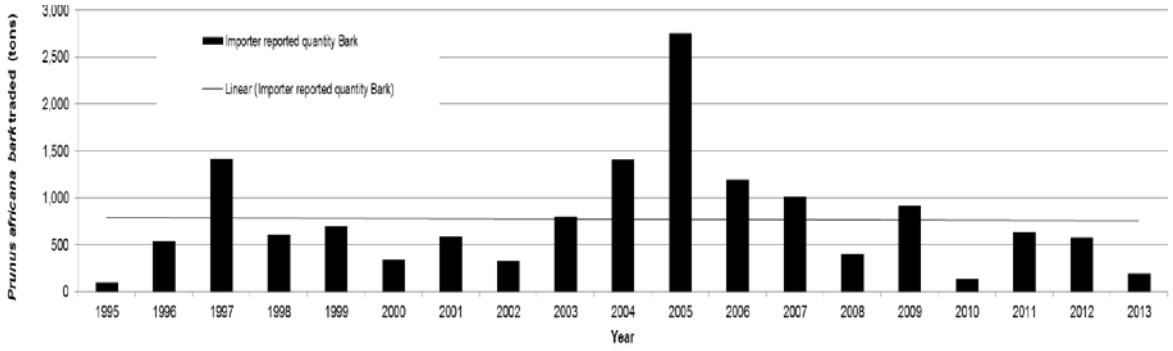
- In 2006 CITES (16) classed the trade from Burundi, Cameroon, Equatorial Guinea, Kenya, Madagascar, DR Congo and Tanzania as of urgent concern. Imports to the European Union were suspended from Cameroon in 2007; and from Angola, Burundi, Comoros, Ethiopia, Equatorial Guinea, Kenya, Madagascar, Malawi, Mozambique, Nigeria, Rwanda, Sao Tome & Principe, South Africa, Sudan, Swaziland, Uganda, Tanzania, Zambia and Zimbabwe in 2008.
- Inability to meet CITES requirements led to self-imposed trade moratoriums (93) being enacted by Cameroon (2007-2010), Burundi (since 2006), Kenya (since 2002) and Madagascar (2006-2014), while CITES suspended all exports from DR Congo, Equatorial Guinea and Tanzania in the period 2009 to 2014.[1]

Economic importance

Trends

Figure 1 shows two major peaks in bark trade, in 1997 and 2005, since CITES records commenced in 1995. The EU CITES import restrictions and moratoriums led to world production decreasing after 2007, with a subsequent gradual resumption since 2011.

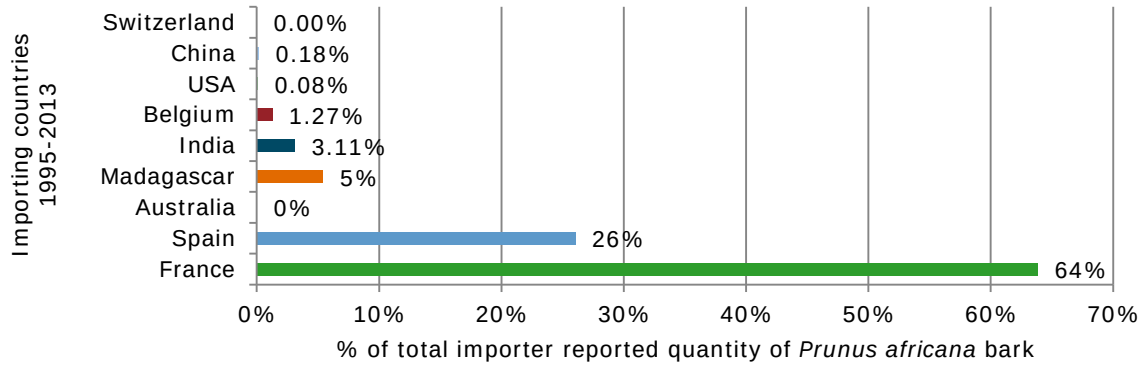
Figure 1 *Global trade in pygeum bark*



Source: WCMC CITES Database 2014

Based on WCMC CITES data (10), Cameroon has consistently been the world's largest pygeum exporter, with 47% of total exports from 1995 to 2013. Other major exporters include Kenya (14%), DR Congo (16%), Madagascar (7%), Uganda (5%), Equatorial Guinea (5%) and Congo (3%). Cameroon had 38% of global market share from 1995 to 2004. After 2004, Cameroon's share increased as other exporting countries decreased production, resulting in Cameroonian exports accounting for 65% of global exports from 2004 to 2013. Although 23 countries imports pygeum bark, only a few countries dominate the trade (Figure 2). Australia and India are the newcomers to the market, importing mainly since 2007.

Figure 2 *Major importing countries*



Source: WCMC CITES Database 2014

[1] See the CITES WCMC site http://www.speciesplus.net/#/taxon_concepts/22086/legal Retrieved 10 May 2015.

Although data on units and type of exports are sometimes unrecorded and questionable,[2] the majority (over 80%) of pygeum exported from producing countries has been in the form of dried bark. Only from Madagascar, Cameroon and to a very limited extent from Uganda, Equatorial Guinea, Congo and DR Congo, have exports of processed pygeum (powder, extracts or derivatives) taken place. Since the 2007 import suspension to the EU, no processed powder or extract has been exported from Cameroon or Madagascar. Pygeum bark exporters indicated that the demand for processed bark depends on the requirements of buyers rather than being supply led. This is partly because importers are wary of processed derivatives due to problems with substitution with other substances in the past, and bark is more easily visually verified.

Current trading patterns

Local trade

The multiple uses and trade of the bark, leaves and berries for medicine, timber for fuelwood and carving, branches for hoes and tools handles, and flowers as important forage sources for bees, has long been known. However, the impact of international trade on pygeum-based products in local markets is unknown. In Cameroon, local trade in the Northwest and West regions appears small scale and environmentally benign, as sourcing from cultivated trees is common (13), unlike in the Southwest region (14). In Kenya there are concerns that the local medicinal trade is unsustainable as most bark originates from wild trees (15). Small-scale trade for traditional medicine between Swaziland and South Africa is thought to be unsustainable (16).

African regional trade

African regional trade is not reflected in WCMC CITES data but has been suspected (17). Signs of a possible border trade between Nigeria and Cameroon have not been detected since 2009 (18). Armed conflicts and the porous borders between Burundi, Rwanda and DR Congo, and between South Africa and Swaziland, mean that these are also possible trade routes (16).

International trade

There appears to be a **continued demand for pygeum bark**. The most recent market study, from 2000 (19), predicted a growing market, due to a generally aging population, who are the main users of the pharmaceuticals based on pygeum bark. Pharmaceutical companies confirmed there is a continued market and demand for pygeum-based pharmaceuticals prescribed for benign prostatic hyperplasia (BPH) which appears stable in at least four European countries (20). Although there is contradictory evidence, a number of studies indicate the bark's efficacy in treating BPH symptoms, chronic prostatitis, sexual and reproductive dysfunctions and obstruction-induced contractile dysfunction (21-24). Whilst there are many alternative plant-based drugs to treat prostate problems, no synthetic chemical alternative exists. The popularity of herbal treatments also continues to grow, with the global market for pygeum-based complementary medicines increasing (25, 26). Opportunities for selling pygeum-based pharmaceuticals in Asia have been increasingly recognised (27-30).

New knowledge

Studies and interventions in the last decade have enhanced knowledge of the ecological, social and economic impacts of changes governing conservation and trade in the species, particularly international commerce.

Ecological implications

The presence of pygeum in natural forests has been shown to be sensitive to the loss of animals which disperse its seeds (31, 32-35). Human activities, particularly harvesting, grazing and fire also influence tree and seedling growth, mortality and reproduction (36, 72). These further negatively influence **forest degradation and habitat loss** (37, 38). One way forward has been to specifically protect mature 'mother' trees as part of local management plans (39). Concerns about the impact of harvesting practices on other species or entire ecosystems have been raised, but not quantified (4, 40).

To manage trade, knowledge of the (wild and planted) status of the species is essential, and is enshrined in the CITES requirements for non-detrimental findings. Extensive **inventories of pygeum in natural forests** have been conducted to establish non-detriment findings for CITES in Cameroon (41-53), with recent inventories conducted in Burundi (54), Congo (55), Madagascar (56), Uganda (57, 58) and DR Congo (55). An adaptive cluster sampling approach was proposed after testing different inventory methods (42), due to the low densities and clustered nature of the species (59). This is being used by an ITTO project (56) supporting

[2] National CITES authorities provide data for the WCMC CITES database. Differences between importer and exporter recorded quantities result from differences in how products are recorded, missing data, the units used, and time lags between authorisations, exports and publishing data.

inventories of pygeum in Cameroon(41, 42, 43, 53), Burundi (54) and Zimbabwe (101). However, the adaptive cluster sampling approach can also overestimate plant populations (102). The differences in inventory methods - particularly whether assessments of tree health and prior harvesting are included in inventories and subsequent calculations of harvestable bark quantities - highlight the need for an international, well-tested, standard inventory method. Full (100%) inventories have been recommended for pygeum located in protected areas and on farms (60). A standardised method needs to balance scientific rigour against the costs, time and local capacity to conduct such inventories. Experiences indicate that over-estimates of stocks based on some inventory methods have resulted in harvesting quotas being established which have been met by harvesting (unregistered) bark from farmed sources (18).

Inventories of cultivated trees commenced in Cameroon in 2009 (8, 51). These indicate that in the Southwest, around 8% of harvestable volumes can be obtained from cultivated trees (41, 46, 61, 62). In the Northwest, inventories are ongoing, but suggest that at least 17% of total available stock exists as cultivated trees (8, 42). An (unproven) assumption is that cultivation will take pressure off wild trees (63), based on experiences with rubber (64, 65) (*Funtamia elastica* and *Parahancornia fasciculata)*, damar (*Canarium strictum*) (66) and gum arabic (*Acacia* spp.)(67), all tree species which have also been at risk from unsustainable harvesting and over-exploitation.

For cultivated trees, **felling or coppicing** followed by totally stripping the bark could be a harvest method (18, 68). The timber can then also be sold. Studies indicate that the tree's high quality hardwood and relatively fast growth rates make this an attractive option for farmers and provide good economic returns, avoiding laborious bark harvests and the mortality rates that occur even with sustainable harvest techniques (69). This method has been used in Madagascar and Kenya. Felling may be an option as the onus on replacement is different for cultivated than for wild trees, if registration and effective controls exist.

Conservation implications

The threats of climate change, forest fragmentation, degradation and loss, have highlighted the importance of understanding **genetic variation** in the species. Natural changes in the climate over the last millennia have influenced where pygeum grows and how genetic diversity (the differences among trees that are inherited) is distributed (1, 70). The genetic profile and level of biochemicals in pygeum bark vary between Central Africa, east and west of the Eastern Rift Valley, southern Africa, and Madagascar (1, 70). The main differences are between Madagascar, East and West Africa (3, 7). There are also some differences between mountain ranges in some countries. For example, in Cameroon, pygeum in Adamaoua is slightly different from that in the Northwest and Southwest highlands and also in Uganda, between Kibale National Park and Ruwenzori National Park[i]. Cultivated trees have generally, (but not always), been sourced from seedlings and seed gathered locally, and so often have similar genetic and biochemical profiles to trees naturally occurring in the same region (8, 71). Predictions of climate change indicate that the major exporting countries most likely to be negatively affected by a loss of natural habitats suitable for pygeum are Tanzania, Madagascar, Cameroon, DR Congo and Uganda (1).

The vulnerability of pygeum to multiple threats including deforestation and degradation, harvesting, and other anthropogenic threats such as fire and grazing by livestock (44, 72, 73) indicates a need to set **high priority areas for conservation** (1, 4, 9)**.** As local use, deforestation and habitat fragmentation vary widely among countries, strategies need to be adapted depending on the type and magnitude of threats. These strategies include ***in situ*, *circa situ* and *ex situ* conservation.** A major consideration in setting conservation areas is whether harvesting would be permitted. For example, although strongly advised not to harvest in protected areas in Cameroon (8), harvesting is allowed and controls are no different than for pygeum in protected areas such as the Oku Plantlife Sanctuary, Nkom-Wum Forest Reserve and Mount Muanengouba. Only in Mount Cameroon National Park are regulations stronger due to a long-running sustainable forest management project (39, 88). These practices indicate that protected status of both the species and geographic area has not taken pressure off the resource in the wild and calls into question the efficacy of such protection. Similarly, in protected areas such as in North and South Kivu in DR Congo, low levels of government presence and capacity, monitoring and law enforcement (74) suggest that protected area status alone is insufficient to ensure conservation.

Livelihood implications

Incomes and profits from harvesting have varied enormously over time and are generally unequally distributed between stakeholders involved in the chain. The differences are linked to the governance arrangements in

force in different countries. Harvesters generally earn less and their profit margins are lower compared to traders, exporters and industrial processers (13, 40), and harvesters in some areas, for example the Southwest of Cameroon, generally gain a higher, more regular income in the major harvest years than in other areas in Cameroon (13, 18, 92, 97, 98). Revenues have also been earned by elites and corrupt civil servants (13, 40).

Although farmers have sold farmed pygeum bark for decades in Cameroon (75) and in Kenya (76, 77), an issue is that formal recognition of provenance, and mechanisms to allow and trace sales from planted sources, are only slowly emerging. Recent experiences indicate that farmers are generally not aware of the need to register their trees (8) and that cultivated bark is sold as wild sourced - and vice versa (13). Cultivation however can be a more profitable option than wild harvest (68, 78). These factors highlight the need for **policy and regulatory systems that actively support trade of cultivated pygeum**. This includes promoting ways for farmers and communities that manage pygeum in natural forests to increase profits. Tracing cultivated trees using genetic markers could be a way to distinguish planted pygeum. An issue will be the cost and ease of implementing such controls at farm level.

A problem hindering cultivation experienced in many countries, is the **legal status of owning land and trees**, as many farmers do not have official land title. Secure tenure has been noted as being critical for long-lived tree crops (69, 79). This is especially true when national regulations classify first-generation seedlings as wild, implying that they are state property (80, 81). There is however a risk that gains to a wider number of people may be limited because if people do not have access to sufficient land, or do not have land property rights.

The total **costs of regulating harvesting** compared to the economic returns and conservation benefits have been questioned. In Cameroon a series of bilateral, donor and government-funded projects over the last fifteen years, have resulted in many of the costs of inventories, monitoring and control not being borne by harvesters or exporters. Economic benefits are also unequally distributed, with the highest economic benefits accruing mainly to importers and exporters (40, 82). Governments have also benefited from the issuing of permits and taxes (82, 83), although considered inconsequential by the ministries responsible for forestry law compared to revenue from timber. New regulations introduced to meet CITES requirements, are aimed at increasing the sustainability of wild harvesting, but have meant fewer harvesters are engaged in harvesting in Cameroon (40). They have however resulted in higher levels of income per harvester and will benefit communities and tree owners more (18). A similar situation occurred in Madagascar when regulations were tightened, decreasing the number of harvesters and locating market power to a small number of companies (83). A cost-benefit analysis of harvesting in Mount Cameroon National Park indicates that the costs of monitoring and enforcing harvesting in protected areas are significantly higher than in non-protected areas, with most (56%) costs related to legal requirements (inventory, permits, control and monitoring), followed by harvesting (30%), export (8%) and regeneration and planting (8%). This questions the economic efficiency of wild harvests in protected areas (82). Although the costs of harvesting in the National Park are higher than in community forests and non-protected areas, the quantity of bark available in the Park and buffer zone means that it is still economically viable (18).

New governance mechanisms

Trade in pygeum across Africa to date has not had a good track record in being conducted sustainably. National regulations have been enacted to protect the species in many countries, many stimulated by CITES and IUCN listings. For example, pygeum has been classed as a 'Special Forestry Product' in Cameroon since 2006, and is specifically regulated by the Madagascar and Kenya Forest Acts and the DR Congo Forest Code. Guidance and **national management plans** to meet CITES requirements are however at varying stages of development, approval and implementation in Equatorial Guinea (84), Cameroon (8, 40), Madagascar (56), DR Congo (85) and Uganda (57, 58). Learning from the experiences of countries currently implementing plans which meet the CITES significant trade review and non-detriment findings could be enhanced. For example, by exchanges similar to the CITES Naivasha 2008 (93) meeting.

Attempts to use **different forest governance arrangements** to empower harvesters such as community forests, Prunus Allocation Units and protected areas in Cameroon have had very mixed results but generally limited success (13, 39, 40, 88, 89). Investments in capacity building, strong monitoring and enforcement remain important in such models (13, 36, 40, 87, 88).

Standards for inventories for wild (in protected and non-protected areas) and for cultivated pygeum differ from country to country. In Cameroon, national guidelines have not been formally published, but have been in development since 2010 (59). There are notable differences in methods used in practice, particularly the requirement to inventory tree health and prior harvesting status, as part of determining a sustainable quota (60). Guidelines have been published but not adopted for Equatorial Guinea (84).

Harvesting guidelines, including recommendations for the time between repeat harvesting of bark from the same tree, have been developed. These build on decades of experience (59, 86). However, experiences in Cameroon (82, 87-89) and Madagascar (83, 90) strongly indicate that without adequate monitoring and control by regulatory authorities, and by local communities and customary rulers, guidelines and laws alone do not guarantee sustainable harvesting. This failure has been attributed to high demand for bark and the power and influence exporters and importers have in the value chain (13, 40). Development, research and conservation organisations have often had a critical role in ensuring enforcement and raising concerns about illegal and unsustainable harvesting (40, 87, 89, 91, 92).

Most countries have monitoring systems based on quota-based permits (57, 93) and in-the field monitoring of tree status by state agencies, and by projects and students which are generally one-off evaluations (44, 45, 72, 87, 89). Alternative **monitoring systems** based on genetic (DNA) traceability are planned to be investigated by an ITTO-CITES programme with the government of Cameroon in 2015. Critical to the workability of such systems will be a reasonable cost to implement and ability to conduct DNA analysis nationally in origin countries. Other alternatives for monitoring may be possible - for example voluntary certification systems (94), such as the FairWild Standard for medicinal plants, information and communication technology and bar-coding - but are not known to have been tried or implemented.

Ways forward

Key issues to ensure sustainable international trade in pygeum include:

1. If wild harvesting is to continue ...

- Consensus is needed if wild harvest is **realistically sustainable.** This is given the growing body of evidence that suggests that wild harvest is not sustainable, due to the nature of the tree and harvest methods, combined with the generally remote and difficult-to-access mountain location and difficulties in setting up and maintaining legal and customary governance arrangements to ensure sustainable harvesting.
- An international scientific consensus is needed on appropriate **inventory methodologies** for wild (in protected and non-protected areas) and for cultivated pygeum. The method needs to balance scientific robustness, cost and time implications, and involve local communities to promote ownership and knowledge of locally-owned and managed resources.
- Ensuring **effective governance** of the species and its ecosystem is essential. Experiences, particularly from Cameroon, highlight that building the capacity of management authorities, implementing new systems and conducting inventories takes time. However, the pressures on natural habitats harbouring pygeum are high and require a precautionary conservation approach that also considers livelihoods of local communities and tree owners. Where enforcement levels are low, and corruption and profits from trade are high, there are significant risks that governance arrangements, which appear to meet CITES requirements on paper have failed (40, 82). **Monitoring and enforcement** financed by pygeum revenues appear key elements of workable governance arrangements.
- An awareness that different governance arrangements result in **diverse trade-offs between the benefits of trade for different stakeholders and species and ecosystem conservation**, is important. Restricting access to the resource can help governments control large, often remote areas more easily. Requirements to conduct inventories raise costs for (small) enterprises to enter the market. They can lead to monopoly or oligopoly situations, such as in Kenya, Cameroon, Uganda and the DR Congo, where national markets are, or have been, dominated by a small number of traders and/or exporters. Such control may be to the disadvantage of tree owners and farmers, community-based resource owners and managers, and harvesters. However, it can allow access to wild trees to be more closely monitored and controlled than when many exploiters are permitted access to one areas, as has been the experience in Cameroon (13, 94).
- The ability of the species to **adapt to local climate changes** will be critical in determining the future availability of wild stocks. Identifying priority populations and enacting strategies to ensure their protection and management will be important to counteract the predicted negative impacts of climate change on the montane forest ecosystems where pygeum grows.

2. Ensuring cultivated bark reaches international market

Evidence, particularly from other tree species (13, 63, 77, 79), suggests that cultivation can reduce pressure on pygeum in natural forests, given the following conditions:

- Improved **traceability systems** that extend from planted trees to exporters and ports, and monitor natural forests to ensure wild pygeum is not sold as cultivated. This includes the standardisation of the type of pygeum-based product and a calibration of the measurement units used in international trade records.
- Promoting the **registration and inventory of farmed trees** to make the current extent of cultivation in all producing countries clearer.
- Supportive **national and international policy and regulatory frameworks**, including tree tenure systems that allow bark from **cultivated** trees to be registered and sold internationally at premium prices.
- Sufficiently **high price** for bark that provides a good economic return for farmers.
- A realisation that **cultivation may benefit different stakeholders** (i.e. not necessary the poorest or forest adjacent) and may create perverse incentives for wild harvest (for the landless, and those with less access).
- Increased **liaison with the pharmaceutical and herbal industry** to ensure that cultivation programs target areas and trees in which the characteristics of the active ingredients meet industry specifications.
- **Tax and policy incentives** to encourage cultivation to trade bark from cultivated trees that make this at least as attractive as wild harvesting.
- Importers, governments in countries where pygeum is consumed and organisations such as CITES engaging with exporters and communities in the supply chain to stimulate the cultivation of bark. For example, by supporting the creation of tree nurseries and advocating the registration of planted trees, and through regulations that enable trade in cultivated bark.

3. The business case for sustainable pygeum

The low prices received by harvesters (in terms of the proportion of export price) and low level of processing in origin countries (82, 95) suggest that a **stronger business case** can be made to finance and encourage sustainable local value adding and processing for international trade. Experiences of pygeum and other non-timber forest products, which appear successful in different countries, are:

i. Using **governance arrangements and capacity building** (organisational, technical and financial) to change the structure, power balance and barriers to a profitable trade based on wild and cultivated pygeum in national value chains, at farmer and harvester level (96-98).
ii. **Adding more value and increasing profit** by processing bark (such as drying, producing chips, powder or extract) in the country of origin.
iii. Using **collective action**, such as harvesters grouping into unions, associations and community forests has been one way of increasing the negotiating power of harvesters. Whilst collective action by harvesters in Cameroon has resulted in pygeum bark price increases, the way costs and benefits are distributed varies widely between the main harvest areas, with profits dependent on the total volume of bark that can be sustainably harvested over a given period, assuming controls are in place to ensure that over-exploitation does not occur.
iv. Projects and initiatives to **supply planting material** have improved access to quality seeds and seedlings and raised farmer's awareness of cultivation techniques and the market for pygeum bark.
v. Attempts to **shorten the value chain and increase profits** have been tried in Cameroon, with harvester associations obtaining permits to export. However, building the skills, experience and expertise to engage in processing and export, and sufficient financial capacity, have proven difficult issues to successfully address (18, 99, 100).
vi. An analysis of the **costs and benefits of cultivated versus wild harvesting** in the same geographic location for harvesters and their organisations is need to confirm the current situation and now outdated studies that compare the profitability of both options.

Making choices - alternative governance options

It has been recognised that the capacity of CITES legal instruments to ensure sustainable international trade are limited. Also, that devolution of ownership or user rights of species to communal levels is not always possible. It has also been recognised that economic incentive structures in combination with effective controls and creating trade opportunities rather than trade restrictions - can provide incentive-driven conservation strategies (5). Bearing these issues in mind, different approaches to govern international trade are possible, each with its own economic, social and environmental implications. These include:

1. Harvesting cultivated trees only and no wild harvest, for export trade.
2. Exporting processed bark only - adding more value for local livelihoods and following the examples of many timber producers in Africa.
3. Ensuring distinct gene pools remain in the different mountain ecosystems in each range state (1, 7). These should be protected by legislation and a precautionary approach taken by not harvesting in these locations or gene pools. This may have implications for current harvesting in protected areas, for example in Burundi and DR Congo, Madagascar and in Cameroon, which occurs currently contrary to guidance in some countries (8).
4. The CITES listing is reassessed in each range state in terms of threats given current knowledge of the extent of wild and cultivated trees. The Austrian CITES Management Authority (5) has recommended that to avoid negative incentives and support pygeum-based livelihoods, the international CITES, community may need to consider whether CITES Appendices listing decisions should be based not only on biological/trade criteria but also on socio-economic considerations, if it is in the conservation interest of the species concerned.
5. IUCN listings are reassessed in each range state, particularly in the light of data on predicted climate changes, deforestation and degradation, and for countries who do not participate in the international trade.
6. National and international (via the UNEP WCMC) monitoring and traceability systems distinguish and identify both wild and cultivated sources in international bark trade.

Acknowledgements

We thank Terry Sunderland (CIFOR) for reviewing this briefing

Knowledge required to meet policy needs

The following information gaps have been identified as important, but lacking, that can aid decision makers in making decisions about sustainable management of international trade (4):

1. Assessing the role for techniques such as high resolution satellite imagery in inventories.
2. Strategies to select desirable traits (e.g. bark chemical composition, adaptability to climate changes, bark growth rates) in cultivation and domestication strategies at local and national level.
3. The cost-effectiveness of traditional and high tech (e.g. DNA-based) monitoring.
4. Cost-benefits and business models for wild and cultivated bark and other pygeum products.
5. Monitoring the long-term impacts of sustainable harvesting norms on tree health, mortality and populations over time periods of two or three harvests.
6. Assessing the broader impacts of harvesting on populations and ecosystems, and the potential long-term evolutionary impacts.
7. Practical work on how to implement adaptive management programmes for the species in priority conservation areas.
8. Research to work out how to support the use of cultivated resources and methods to support the effective integration of cultivated pygeum sources into value chains

Prunus africana bark harvested multiple times from the same tree for international trade, Mount Cameroon, Cameroon

References

1. Vinceti, B., J. Loo, H. Gaisberger, M.J. van Zonneveld, S. Schueler, H. Konrad, C.A. Kadu, and T. Geburek, 2013, *Conservation priorities for Prunus africana defined with the aid of spatial analysis of genetic data and climatic variables.* PloS one, 8(3): p. e59987.
2. Mbatudde, M., M. Mwanjololo, E.K. Kakudidi, and H. Dalitz, 2012, *Modelling the potential distribution of endangered Prunus africana (Hook. f.) Kalkm. in East Africa.* African Journal of Ecology, 50(4): p. 393-403.
3. Muchugi, A., A.G. Lengkeek, C.A.C. Agufa, G.M. Muluvi, E.N.M. Njagi, and I.K. Dawson. *Genetic Variation in the threatened medicinal tree Prunus africana in Cameroon and Kenya: Implications for current management and evolutionary history*. in *The role of biotechnology*. 2005. Villa Gualino, Turin, Italy.
4. Smith, M.J., H. Benítez-Díaz, M.Á. Clemente-Muñoz, J. Donaldson, J.M. Hutton, H. Noel McGough, R.A. Medellin, D.H. Morgan, C. O'Criodain, and T.E. Oldfield, 2011, *Assessing the impacts of international trade on CITES-listed species: Current practices and opportunities for scientific research.* Biological Conservation, 144(1): p. 82-91.
5. Abensperg-Traun, M., 2009, *CITES, sustainable use of wild species and incentive-driven conservation in developing countries, with an emphasis on southern Africa.* Biological Conservation, 142(5): p. 948-963.
6. Farwig, N., B. Bleher, and K. Bohning-Gaese, 2006, *Consequences of forest fragmentation on frugivores, seed dispersal and genetic structure of Prunus africana populations in Kenya.* Journal of Ornithology 147(5): p. 114-114.
7. Kadu, C.A.C., H. Konrad, S. Schueler, G.M. Muluvi, O. Eyog-Matig, A. Muchugi, V.L. Williams, L. Ramamonjisoa, C. Kapinga, B. Foahom, C. Katsvanga, D. Hafashimana, C. Obama, and T. Geburek, 2013, *Divergent pattern of nuclear genetic diversity across the range of the Afromontane Prunus africana mirrors variable climate of African highlands.* Annals of Botany, 111: p. 47–60.
8. Ingram, V., A. Awono, J. Schure, and N. Ndam, 2009, *Guidance for a National Prunus africana Management Plan, Cameroon*, in *Project GCP/RAF/408/EC « Mobilisation et Renforcement des Capacités des Petites et Moyennes Entreprises impliquées dans les Filières des Produits Forestiers Non Ligneux en Afrique Centrale »*, CIFOR, Editor. FAO-CIFOR-SNV-World Agroforestry Center-COMIFAC-GTZ: Yaoundé, Cameroun. p. 156.
9. Jimu, L., 2011, *Threats and conservation strategies for the African cherry (Prunus africana) in its natural range-A review.* Journal of Ecology and the Natural Environment, 3(4): p. 118-130.
10. UNEP-WCMC, 2014, *UNEP-WCMC CITES Trade Database*. UNEP-WCMC.
11. CITES, 2009, *Eighteenth meeting of the Plants Committee Buenos Aires (Argentina), 17 to 21 March 2009. Review of Significant Trade in specimens of Appendix-II species*, in *Overview of the species-based review of significant trade*. CITES. p. 6.
12. CITES, 2008, *Establishment of the Plants Committee priorities (PC17 Agenda item 12.2)*. CITES. p. 6.
13. Ingram, V.J., 2014, *Win-wins in forest product value chain? How governance impacts the sustainability of livelihoods based on non-timber forest products from Cameroon*, in *Faculty of Social and Behavioural Sciences*. University of Amsterdam: Amsterdam.
14. Nfi, A.N., J.N. Mbanya, C. Ndi, A. Kameni, M. Vabi, D. Pingpoh, S. Yonkeu, and C. Moussa, 2001, *Ethnoveterinary Medicine in the Northern Provinces of Cameroon.* Veterinary Research Communications, 25(Number 1): p. 71-76
15. Njoroge, G.N., 2012, *Traditional Medicinal Plants in Two Urban Areas in Kenya (Thika and Nairobi): Diversity of traded species and conservation concerns.* Ethnobotany Research & Applications, 10.
16. CITES. *Review of Significant Trade in specimens of Appendix-II species Species selected following COP11 and COP12*. in *CITES Sixteenth meeting of the Plants Committee*. 2006. Lima, Peru.
17. Cunningham, T., 2008, *Prunus africana: in situ conservation, sustainable management and governance*, in *CITES*. Geneva. p. 59.
18. Ingram, V., 2014, *Profitability and value chain analysis of Prunus africana commercialisation from Mount Cameroon, Cameroon*, P.-. GIZ, Editor. Coopération Germano – Camerounaise. Ministère des Forêts et de la Faune (MINFOF). Ministère de l'Environnement et de la Protection de la Nature et du Développement durable (MINEP). Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH: The Netherlands and Cameroon. p. 100.
19. Pomatto, V., 2001, *Etude de marche du Pygeum africanum en Europe*. GTZ MINEF: Yaounde. p. 59.
20. Hutchison, A., R. Farmer, K. Verhamme, R. Berges, and R.V. Navarrete, 2007, *The efficacy of drugs for the treatment of LUTS/BPH, a study in 6 European countries.* European Urology, 51(1): p. 207-216.
21. Melo, É.A., E.B. Bertero, L.A.S. Rios, and D. Mattos JR, 2002, *Valuating the efficiency of a combination of Pygeum africanum and stinging nettle (Urtica dioica) extracts in treating benign prostatic hyperplasia (BPH): Double-blind, randomized, placebo controlled trial.* International Journal Brazilian Urology, 28(5): p. 418-425.
22. Wilt, T., A. Ishani, R. MacDonald, and G. Stark, 2003, *Pygeum africanum for benign prostatic hyperplasia (Cochrane review)*, in *The Cochrane Library*. Cochrane Library: Oxford.
23. Anon., 2002, *Pygeum africanum - Prunus africana - African plum tree - Monograph: Pygeum africanum*. Alternative Medicine Review.
24. Brouwers, J.R.B.J. and T.N.M. Langemeijer, 2003, *Farmacotherapie van benigne prostaathyperplasie. Van de drup in de regen?* Pharmaceutisch Weekblad, 138(40): p. 1403-1406.
25. Barnes, J., 2003, *Quality, efficacy and safety of complementary medicines: fashions, facts and the future. Part II: Efficacy and safety.* British journal of clinical pharmacology, 55(4): p. 331-340.
26. Hashim, H. and P. Abrams, 2010, *Emerging drugs for the treatment of benign prostatic obstruction.* Expert opinion on emerging drugs, 15(2): p. 159-174.
27. Anon, 2003, *Company News.* Asia Pacfic Biotech News, 7(8): p. 310.
28. Ghosh, B., 2008, *Rich doctors and poor patients: Market failure and health care systems in developing countries.* Journal of Contemporary Asia, 38(2): p. 259-276.
29. Kim, S.W., 2012, *Phytotherapy: emerging therapeutic option in urologic disease.* Translational Andrology and Urology, 1(3): p. 181-191.
30. Doke, R.M., A.M. Mahale, A.R. Karanjkar, and S.A. Amge, 2013, *Recent trends for neutraceuticals in the Indian market.* Indo American Journal of Pharmaceutical Research, 3(5): p. 4001-1020.
31. 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: p. 449–459.
32. Farwig, N., B. BLEHER, and K. BOHNING-GAESE, 2006, *Consequences of forest fragmentation on frugivores, seed dispersal and genetic structure of Prunus africana populations in Kenya.* Journal of Ornithology 147(5): p. 114-114.
33. Maisels, F. and P. Forboseh, 1999, *Phenology of the major tree and shrub species of the Kilum-Ijim forest*, in *Ecological Monitoring programme*, K.-I.F. Project, Editor. BirdLife International and The Ministry of Environment and Forestry Cameroon. p. 16.
34. Fossey, D., 1983, *Gorillas in the mist*. first ed. St Ives: Phoenix. 282.
35. Chapman, H., R. Bekker, J. Barnard, and G. Shu, 2007, *The botany of Tchabal Mbabo A contribution towards the Nigerian / Cameroon Transboundary initiative*, N.M.F. Project, Editor. University of Canterbury/Nigerian Montane Forest Project: Canterbury, New Zealand.
36. Stewart, K., 2009, *Effects of bark harvest and other human activity on populations of the African cherry (Prunus africana) on Mount Oku, Cameroon.* Forest Ecology and Management, 258(7): p. 1121-1128.
37. Ayodele, I.A. and E.A. Tsi, 2002, *Forest fragmentation and the loss of birds, an issue of immediate attention at Kilum-Ijum Community Forest, Cameroon.* Nature & Faune, 18.
38. Bergl, R.A., J.F. Oates, and R. Fotso, 2007, *Distribution and protected area coverage of endemic taxa in West Africa's Biafran forests and highlands.* Biological Conservation, 134: p. 195-208.
39. Eben Ebai, S., 2011, *Prunus africana Management plan for the Mount Cameroon National Park and it's Support Zone*. Prepared by Regional Delegation of Forestry and Wildlife in collaboration with the Programme for the Sustainable Management of Natural Resources for the South West (PSMNR-SW) and local stakeholders.: Buea. p. 36.
40. Cunningham, A., M.-L. Avana Tientcheu, V. Anoncho, R. Nkuinkeu, and T. Sunderland, 2014, *Power, profits and policy: A reality check on the Prunus africana bark trade*, in *Working Paper 153*. CIFOR: Bogor, Indonesia.
41. Akoa, A., J.-L. Betti, N.B. Ewusi, N. Mbarga, Z.H.C. Akagou, C. Fonkoua, A.W. Mala, and C. Nkouna Abia, 2011, *Report on sustainable harvesting of Prunus africana (Rosaceae) in the Mount Cameroon*, in *Report prepared for the National Forestry Development Agency (ANAFOR), the Cameroon CITES Scientific Authority for flora, in the frame of the project 'Non-detriment findings for Prunus africana (Hook.f.) Kalkman in Cameroon'*. ANAFOR. p. 24.
42. Akoa, A., J.-L. Betti, N.B. Ewusi, N. Mbarga, Z.H.C. Akagou, C. Fonkoua, E.R. Essomba, and N.C. Abia, 2010, *Preliminary report on sustainable harvesting of Prunus africana (Rosaceae) in the North West region of Cameroon*, National Forestry Development Agency (ANAFOR), Editor. MINFOF: Yaounde. p. 72.
43. Betti, J.L. and J. Ambara, 2013, *Mass of Prunus africana stem barks on Tchabal mbabo and Tchabal Gang Daba Mountain Forests, Cameroon.* African Journal of Environmental Science and Technology, 7(5): p. 204-221.
44. Foaham, B., S. Dagobert, V. Ingram, and A. Awono, 2009, *Inventaire de Prunus africana dans les provinces du Sud-ouest et du Nord-ouest du Cameroun, Novembre 2007 – Novembre 2008*, CIFOR, Editor. CIFOR: Yaounde p. 97.
45. ANAFOR, 2010, *Inventory of Prunus africana Mt Cameroon*. ANAFOR.
46. Belinga, J., 2014, *Results of the Prunus exploitation inventory in block 3*. CAFRAM: Yaounde.
47. CARFRAM SARL, 2013, *Report of Prunus Exploitation Inventory in Block I on the Mount Cmeroon National Park* Cameroon Forest Resources Assessment and Management: Yaounde. p. 28.
48. Ewusi, B.N., C.A. Asanga, S. Eben Ebai, and J.B.N. Nkongo, 1992, *An evaluation of the quantity and distribution of Pygeum africanum on the slopes of Mt Cameroon*. Plantecam Medicam and the Ministry of Agriculture: Douala and Yaoundé, Cameroon.
49. Tasse, B.D., 2006, *Etat des lieux de léxploitation de lécore de Prunus africana dans la region du Mont cameroun: Cas de la zone Bokwango-Mapanja*. GTZ: Yaounde. p. 17.
50. Acworth, J., 1997, *Results of sustained yield estimates of Prunus africana from Mt Cameroon*, in *Presentation by James Acworth, Forestry Adviser, MCP-Limbe* MCP, Editor. MCP: Limbe. p. 5.
51. Foaham, B., S. Dagobert, V. Ingram, and A. Awono, 2009, *Inventaire de Prunus africana dans les provinces du Sud-ouest et du Nord-ouest du Cameroun, Novembre 2007 – Novembre 2008*, in *Project GCP/RAF/408/EC « Mobilisation et Renforcement des Capacités des Petites et Moyennes Entreprises impliquées dans les Filières des Produits Forestiers Non Ligneux en Afrique Centrale »*. CIFOR: Yaounde p. 97.
52. Betti, J.L. and J. Ambara, 2011, *Mass of Prunus africana stem barks on the Mount Cameroon forest.* International Journal of Biodiversity and Conservation, 3(7): p. 267-279.
53. Underwood, F.M. and R.W. Burn, 2000, *Biometric aspects of sampling for the Cameroon inventory of Prunus africana, Mount Cameroon Pilot Phase*, MCP, Editor. Statistical Services Centre, Department of Applied Statistics, The University of Reading: Reading. p. 18.
54. Betti, J.L., M. Feruzi, J. Rushemeza, A. Rurantije, L. Nzigiyimpa, F. Ndabahagamye, J. Ahishakiye, D. Manariyo, E. Buvyiruke, and J.C. Ndayishimiye, 2013, *Exploitable stock of Prunus Africana stems in the Teza Forest, Kibira National Park, Burundi.* International Journal of Agriculture Innovations and Research, 2(3): p. 317-326.
55. ICCN, 2013, *Potentiel sur pied de Prunus africana (Rosaceae) dans la zone de Walikake, province du Nord - Kivu en Republique Democratique du Congo*, in *projet « Avis de commerce non préjudiciable sur Prunus africana*

(Hook.f.) Kalkman en RDC». l'Institut Congolais pour la Conservation de la Nature (ICCN), Autorité scientifique de la CITES pour la République Démocratique du Congo.
56. ITTO/CITES, 2010, *S'assurer que le commerce international des especes d'arbres africaines inscrites a l'annexe II de la CITES est compatible avec leur conservation*, in *Rapport du 2ème Atelier Régional du Programme conjoint OIBT – CITES. Hotel Seme Beach, Limbé, Cameroun, du 29 Septembre au 02 Octobre 2010*. ITTO CITES.
57. Hafashimana, D.L.N., 2011, *Shared experiences in managing export of P. africana bark*. p. 9.
58. Mpangire, S., 2011, *Shared experiences in managing export of P. africana bark*. p. 9.
59. Ministry of Forestry and Wildlife, 2010, *Prescriptions towards sustainable bark strip harvesting techniques of Prunus africana in Cameroon : « The 2/4 harvesting method»* in *Guide for operational debarking method*, D.o.F. General Secretariat, Editor. GTZ and Republic of Cameroon: Yaounde, Cameroon. p. 29.
60. Tchouto, P., 2013, *Prunus africana Exploitation Inventory Guidelines for the Mount Cameroon National Park and its Support Zone*. Programme for the Sustainable Management of Natural Resources, South West Region of Cameroon (PSMNR-SWR): Buea. p. 26.
61. MIPELDA, 2012, *Rapport d'inventaire d'exploitation du Prunus africana Parc National du Mont Cameroun Bloc Annuel d'amenagement I*. MIPELDA. p. 34.
62. Tchouto, P., N.K. Egbe, and S. Eben Ebai, 2014, *Prunus africana inventory in privately owned farms in the Mount Cameroon Prunus Allocation Unit, South West Region, Cameroon*. Programme for the Sustainable Management of Natural Resources in the South West Region of Cameroon (PSMNR-SWR): South West Regional Delegate, Buea, Cameroon. p. 46.
63. Dawson, I.K., R. Leakey, C.R. Clement, J.C. Weber, J.P. Cornelius, J.M. Roshetko, B. Vinceti, A. Kalinganire, Z. Tchoundjeu, E. Masters, and R. Jamnadass, 2014, *The management of tree genetic resources and the livelihoods of rural communities in the tropics: Non-timber forest products, smallholder agroforestry practices and tree commodity crops.* Forest Ecology and Management.
64. Serra, M., P. Shanley, T.M.d. Silva, A.C. Fantini, G.d.S. Medina, and P.R. Vieira, 2010, *The ecology, local management and trade of amapá amargoso Parahancornia fasciculata (Poir) Benoist in the state of Pará*, in *Recent devleopments and Case studies in Ethnobotany*, N.H. Ulysses Paulino de Albuquerque, Editor. NUPEEA/SBEE. p. 213-231.
65. Geschiere, P., 2007, *Monetary Transactions in Atlantic Africa Regional Shifts—Marginal Gains and Ethnic Stereotypes.* African Studies Review, 50(2): p. 43–56.
66. Kusters, K., M.R. Pérez, H.d. Foresta, T. Dietz, M. Ros-Tonen, B. Belcher, P. Manalu, A. Nawir, and E. Wollenberg, 2008, *Will Agroforests Vanish? The Case of Damar Agroforests in Indonesia.* Human Ecology, (36):p. 357–370.
67. Coppen, J., 1995, *Gums, resins and latexes of plant origin*. Non-Wood Forest Products. Rome: FAO.
68. Cunningham, A.B., E. Ayuk, S. Franzel, B. Duguma, and C. Asanga, 2002, *An economic evaluation of medicinal tree cultivation. Prunus africana in Cameroon* People and Plants Working Paper, 10: p. 1-39.
69. Franzel, S., E. Ayuk, A.B. Cunningham, B. Duguma, and C. Asanga, 2009, *Bark for sale: The adoption potential of Prunus africana as an agroforestry tree for small-scale farmers in Cameroon*, in *Bark: Use, Management and Commerce in Africa*, e.a. A. B. Cunningham, Editor.
70. Kadu, C.A.C., S. Schueler, H. Konrad, G.M.M. Muluvi, O. Eyog-Matig, A. Muchugi, V.L. Williams, L. Ramamonjisoa, C. Kapinga, B. Foaham, Katsvanga, D. Hafashimana, C. Obama, and T. Geburek 2010, *Phylogeography of the Afromontane Prunus africana reveals a former migration corridor between East and West African highlands*. Molecular Ecology, DOI: doi: 10.1111/j.1365-294X.2010.04931.x.
71. Kadu, C.A.C., A. Parich, S. Schueler, H. Konrad, G.M. Muluvi, O. Eyog-Matig, A. Muchugi, V.L. Williams, L. Ramamonjisoa, C. Kapinga, B. Foahom, C. Katsvanga, D. Hafashimana, C. Obama, Barbara Vinceti, R. Schumacher, and T. Geburek, 2012, *Bioactive constituents in Prunus africana: Geographical variation throughout Africa and associations with environmental and genetic parameters.* Phytochemistry, 83: p. 70–78.
72. Nkeng, P.F., V. Ingram, A. Awono, and M.-L.A. Tientcheu, 2009, *Assessment of Prunus africana bark exploitation methods and sustainable exploitation in the South west, North-West and Adamaoua regions of Cameroon*, in *Project GCP/RAF/408/EC « Mobilisation et Renforcement des Capacités des Petites et Moyennes Entreprises impliquées dans les Filières des Produits Forestiers Non Ligneux en Afrique Centrale »*, CIFOR, Editor. FAO-CIFOR-SNV-World Agroforestry Center-COMIFAC: Yaounde. p. 57.
73. Hall, J., E. O'Brien, and F. Sinclair, 2000, *Prunus africana: a monograph*, in *Publication No 18*. School of Agricultural and Forest Sciences, University of Wales Bangor: Bangor. p. 104.
74. Angu, K., C. Pélissier, and N. Tchamou, 2011, *Protected area management in CBFP landscapes: taking stock*, in *The forests of the Congo Basin. State of the forest 2010*. Commission des Forets dÁfrique Centrale. p. 185-205.
75. Cunningham, A.B. and F.T. Mbenkum, 1993, *Sustainability of Harvesting Prunus africana bark in Cameroon. A medicinal plant in international trade.* People and Plants Working Paper 2: p. 1-32.
76. Kenya Wildlife Service. *Conservation and management status of Prunus Africana in Kenya*. in *Workshop on the Implementation of Review of Significant Trade (RST) Recommendations for Prunus africana*. 2008. Naivasha, Kenya.
77. Muriuki, J., S. Franzel, J. Mowo, P. Kariuki, and R. Jamnadass, 2012, *Formalisation of local herbal product markets has potential to stimulate cultivation of medicinal plants by smallholder farmers in Kenya.* Forests, Trees and Livelihoods, 21(2): p. 114-127.
78. Dawson, I., J. Were, and A. Lengkeek, 2001, *La conservation de Prunus africana, arbre médicinal Africain surexploité*, in *Ressources Génétiques Forestières n° 28*, FAO, Editor. Organisation des Nations Unies pour l'alimentation et l'agriculture: Rome. p. 69.
79. Degrande, A., K. Schreckenberg, C. Mbosso, P. Anegbeh, V. Okafor, and J. Kanmegne, 2006, *Farmers' fruit tree-growing strategies in the humid forest zone of Cameroon and Nigeria.* Agroforestry Systems, 67: p. 159-175.
80. Degrande, A., A. Gyau, D. Foundjem-Tita, and E. Tollens, 2014, *Improving smallholders' participation in tree product value chains: experiences from the Congo Basin*. Forests, Trees and Livelihoods, 23(1-2): p. 102-115.
81. Ingram, V.J., N. Ousseynou, D. Midoko Iponga, J. Chupezi Tieguhong, and R. Nasi, 2010, *Non-timber Forest Products: Contribution to National Economy and Strategies for Sustainable Management*, in *The Forests of the Congo Basin - State of the Forest 2010*, C. de Wasseige, et al., Editors. Publications Office of the European Union: Luxembourg. p. 137-154.
82. Ingram, V., 2014, *Win-wins in forest product value chains? How governance impacts the sustainability of livelihoods based on non-timber forest products from Cameroon*, in *Amsterdam Institute for Social Science Research, Governance and Inclusive Development Group*. University of Amsterdam: Amsterdam. p. 361.
83. Neimark, B., 2010, *Subverting regulatory protection of 'Natural Commodities': The Prunus africana in Madagascar.* Development and Change, 41(5): p. 929–954.
84. Navarro-Cerrillo, R.M., M. Clemente-Muñoz, and M.A. García-Ferrer-Porras. *Setting export quotas of Prunus africana: Guidelines for a Management Plan*. in *Workshop on Implementation of Review of Significant Trade (RST) Recommendations for Prunus africana*. 2008. Naivasha, Kenya: Naivasha, Kenya, 8-11 September 2008.
85. ICCN, 2013, *Proposition d'activite a L'organisation Internationale des Bois Tropicaux (OIBT)/Projet Gestion Durable des Especes CITES dans le Bassin du Congo. Soumise par le Gouvernement de la République Démocratique du Congo* ICCN. p. 1.
86. Direction des Eaux et Forêts, 1997, *Permit for exploitation of Prunus africana* Government of Madagascar,: Antananarivo, Madagascar.
87. Meuer, K., 2007, *Monitoring of Prunus africana exploitation on Mount Cameroon*, in *GTZ South-West Antenna*. University of Greifswald, Germany: Buea, Cameroon. p. 20.
88. Tchouto, P., H. Mbeng, and B. Lehrer, 2014, *Monitoring and evaluation report of Prunus africana harvesting activities in Block 1 during 2013, Mount Cameroon National Park* PSMNR-SWR: Buea. p. 12.
89. WHINCONET, 2005, *Report on the illegal harvesting of Prunus africana in the Kilum-Ijim Forests of Oku and Fundong*, C.B.C.S.C. SNV Highlands, Editor. Western Highlands Nature Conservation Network (WHINCONET): Bamenda, Cameroon. p. 19.
90. Dailey, B.W. and E.C.M. Fernandes. *The effect of ecological conditions on density and growth of Prunus africana seedlings in Madagascar*. 2007 [cited 2009 13 march 2009]; Available from: http://www.css.cornell.edu/research/prunus/.
91. Ingram, V., 2008, *Lobby for sustainable harvesting of Prunus in Cameroon*, in *Working Paper*. Netherlands Development Organization (SNV): Bamenda.
92. Ndam, N. and M.T. Marcelin, 2004, *'Chop, but no broke pot': the Case of Prunus africana on Mount Cameroon*, in *Forest Products, Livelihoods and Conservation. Case Studies of Non-Timber Forest Product Systems*, T. Sunderland and O. Ndoye, Editors. Center for International Forestry Research: Bogor, Indonesia. p. 37-52, Chapter 3.
93. CITES. *Summary report of the workshop on implementation of the review of significant trade recommendations for Prunus africana*. in *Workshop on Implementation of Review of Significant Trade recommendations for Prunus africana*. 2008. Naivasha, Kenya: CITES, Prunus africana Working Group.
94. Chupezi, T.J. and O. Ndoye, 2004, *National Analysis of Trade-Related Instruments Influencing Trade in African cherry (Prunus africana) and the African grey parrots (Psittacus erithacus): Applications and Impacts on Poverty Alleviation and Sustainable Forest Management in Cameroon*, in *Non-Wood Forest Products Programme*. Food and Agricultural Organization for the United Nations (FAO): Yaounde. p. 49.
95. Walter, S. and R. J-C.R., 1995, *L'exploitation de Prunus Africana a Madagscar*, P.Z.e.D.d.E.e. Forets, Editor.: Antananarivo, Madagsacar.
96. Stanley, E., 2009, *Report On Economic and Financial Feasibility of Mt Cameroon Prunus Management Group (MOCAP)*, in *GTZ- ProPSFE Support Programme to the Implementation of the Forest Environment Sector Programme*. GTZ. p. 15.
97. Ekatie, J. and O. Mambo. *Exploitation and Commercialisation of Non-timber Forest Product in Cameroon, The Experience of the Mount Cameroon Prunus management Common Initiative Group (MOCAP)*. in *Situation of Non-timber Forest Products in the Central African Sub-region*. 2006. Limbe: FAO.
98. Ehlers, C., 2013, *Prunus Exploitation Management practices in MCNP. Report: Working session on current practices*. Programme For The Sustainable Management Of Natural Resources In The South West Region Of Cameroon (PSMNR-SWR): Buea. p. 23.
99. GIZ/ProPSFE, 2012, *Gestion durable des PFNL au Cameroun. Note de cadrage stratégie d'accompagnement ProPSFE*. GIZ/ProPSFE: Yaounde. p. 6.
100. Nguenang, G.M., C. FAPA, J. Schindler, J. Mbolo, and M.L. Ntamekene, 2013, *Le coût de la légalisation des organisations paysannes pour la collecte et la commercialisation des produits forestiers non ligneux au Cameroun. Note de présentation. Leçons apprises accompagnement pilote*. GIZ, Programme d'Appui au Programme Sectoriel Forêt et Environnement (ProPSFE): Yaounde. p. 8.
101. Jimu, L., N. Ngoroyemoto and L. Mujuru. 2013. Structural diversity and regeneration of the endangered *Prunus africana* (Rosaceae) in Zimbabwe." *African Journal of Ecology* 51(1): 102-110.
102. Morrison, L. W., D. R. Smith, C. C. Young and D. W. Nichols. 2008. Evaluating sampling designs by computer simulation: a case study with the Missouri bladderpod. *Population Ecology* 50(4): 417-425.