

## Valorization Potential Assessment: Cameroon

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## Introduction

The main objective of this assessment is to support the valorization of genetic resources (GR) and to inform the development of national ABS frameworks. With a view to increasing the potential benefits arising from the utilization of GR, there is a need to bridge the gap between providers of GR and their potential users in foreign countries.

For this purpose, four key elements are examined:

Section one examines recent developments with respect to the establishment of a national ABS framework in Cameroon.

In section two, an overview of Cameroonian actors potentially using or involved in R&D on GR is presented. It seeks to answer the following questions: Which actors are valorising and/ or utilising GR in Cameroon? How are they connected to each other and to foreign users? Are they capable to meet the users' R&D requirements? What are the gaps?

In section three, an overview of the economic potential of the species is drawn from the separate study on the countries' biodiversity in the global patent systems: Cameroon. The main question addressed in this report is: what can patent information teach us about the range of potential economic uses of African GR and associated traditional knowledge (TK)?

In section four, the link between patent documents, value chains and markets is presented. Examples were selected to illustrate different types of commercialisation and to highlight the economic potential of the species. Analysis of the value or profits that have been derived from the commercialization of products based on these GR/species is beyond the scope of this assessment.

Finally, conclusions and recommendations are provided with a view to inform the development or revision of the national ABS framework and create an enabling environment for the valorization of GR. This approach seeks to answer the following questions: What are the practical steps to improve the valorization of GR within the ABS framework? What kind of business, legislative and regulatory environment is favourable for this purpose?

### 1. National ABS framework

Following the adoption of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Its Use (NP), in October 2010, member countries of the Central African Forests Commission (COMIFAC) elaborated and adopted a sub-regional ABS strategy in November 2010. This strategy provides guidance to member countries with respect to the elaboration of their national ABS framework.

With a view to implementing this strategy at national level, COMIFAC member countries carried out a number of activities towards the ratification of the NP and its implementation. These included the elaboration of national strategies, awareness-raising campaigns as well as ABS trainings.

Thanks to the support provided by the UNEP/GEF project which was executed by the ABS Capacity Development Initiative to support six African countries in implementing the NP, the Government of

Cameroon adopted a national strategy on ABS in July 2012. This strategy establishes as a priority the elaboration and adoption of a law on ABS. In the interim period leading to the adoption of this law, a regulatory measure (Arrêté) was developed and validated in May 2014 by all relevant stakeholders.

Following the entry into force of the NP on 12 October 2014, the process leading to the signature of the “Arrêté” by the relevant national authority was suspended in order to review the elements of the “draft Arrêté” and transform it into a Decree, with a view to ensure that the ABS measure established would bear more weight, provide further efficiency to the ABS process established in Cameroon, and meet the obligations of the NP.

As of 5 November 2014, the ratification process of the NP by Cameroon had been completed at national level and official ratification was pending the deposit of the instrument of ratification at the United Nations Treaty Section in New York, in accordance with normal procedures.

## **2. Overview of Cameroonian actors potentially using or involved in R&D on GR**

An institutional analysis of the relevant sectors and actors for the valorization of biodiversity, including GR, has not yet been carried out at the country level. The identification of Cameroonian actors was therefore based on desktop study and internet research. Overall, limited information is available on the internet on Cameroonian actors. Actors involved in the valorization of biodiversity generally have a limited public profile as they are often a technical intermediary in long and complex R&D processes. Finally, actors that do not have an internet website could not be identified and are therefore not taken into account in the assessment. While some potential leads are identified, only partial conclusions can be drawn.

### **2.1. Methodology**

The methodology used to identify the actors that are potentially using or involved in R&D on GR was based on the following steps:

- The characteristic of the country’s economy was first examined to identify the key players that could be involved in the utilization of GR (e.g. biodiversity conservation, main actors of the principal economic sectors)
- An internet search based on key words was carried out. The key words used are presented in annex one
- When possible, interviews were realised with individuals having a good knowledge of the actors related to the utilisation of GR, R&D and the valorization of biodiversity in the country<sup>1</sup>
- Specific internet research for each actor was carried out to identify: area(s) of R&D, maintenance of collections (e.g. genes), potential uses of GR and any collaborations with foreign actors (as a basis for potential exchanges of genetic material). For the last two categories, a basic Yes / No / Unclear categorisation was used.
- Based on the facts compiled, 51 actors were identified. Of these, 32 institutions stood out as potentially relevant for ABS as their activities are related to the utilisation of GR.

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<sup>1</sup> In the case of Cameroon, Ms Sarah Laird (researcher and Co-director of People and Plants International) and Ms Prudence Galega (Technical Adviser No. 1, Cabinet of the Minister, Ministry of Environment, Protection of Nature and Sustainable Development) were interviewed.

While a total of 51 actors were identified<sup>2</sup> (listed in the annex two), the most 32 relevant ones are examined in this report (and listed in annex three). They are categorised as follows:

- **Actors providing GR:** they are officially designated under national legislation as institutions with mandate to provide GR
- **Actors which may utilise GR in the context of their broader activity:** it is unclear if they specifically use GR, but it is a possibility in consideration of their mission statement, activities and area of expertise. Based on very limited information available, it is not possible to formally confirm this. There are two sub-categories: public researcher institutions and other institutions (e.g. NGOs, private sector).
- **Actors of the support environment:** they do not directly use GR but they contribute to a conducive valorization environment by providing financial, technical and organizational support to potential providers, users and other actors. They are classified in two sub categories: those that effectively contribute to the support environment and those that present a potential to do so.

## 2.2. Main results: the most relevant actors related to GR

The following examines the actors that seem of particular relevance to the utilisation and valorization of GR. However, due to the lack of information, it was not possible to examine the specific areas of research, projects and the technical capabilities of these actors. Although all these actors are involved in activities related to the valorization of biological resources (BR), it is unclear if and how they utilize GR.

### 2.2.1. Actors providing GR

No institutions are designated as official provider of GR.

### 2.2.2. Actors which may utilize GR in the context of their broader activity

#### Public Research Institutions

Two public institutions, the **National Herbarium**<sup>3</sup> and the **Botanical Garden of Limbé**<sup>4</sup> carry out biodiversity inventories and may carry R&D on GR.

Approximately **13 universities and schools**<sup>5</sup> were identified with various research departments working on biological resources and also potentially using GR including Microbiology, Biotechnology, Forest botanic, Wood Physic & Chemistry, Nutrition and Nutritional Biochemistry. Some have international collaborations for fundamental research. For example, the **Ecole Normale Supérieure** of

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<sup>2</sup> Considering the limited information available, further analysis may indicate that they should be integrated into the core actors concerned by ABS and the economic valorization of GR.

<sup>3</sup> [http://www.biocam.net/sites\\_fr/herbier.htm](http://www.biocam.net/sites_fr/herbier.htm)

<sup>4</sup> [www.kew.org/science-research-data/directory/projects/Limbe Botanic Gardens, Cameroon: Search and Rescue.htm](http://www.kew.org/science-research-data/directory/projects/Limbe_Botanic_Gardens_Cameroon_Search_and_Rescue.htm)

<sup>5</sup> Université de Nagoundéré ([www.univ-ndere.cm](http://www.univ-ndere.cm)), Ecole de Faune de Garoua ([www.ecoledefaune.org/](http://www.ecoledefaune.org/)), Ecole Nationale des Eaux et Forêts Mbal Mayo ([www.riffec.org/spip.php?rubrique17](http://www.riffec.org/spip.php?rubrique17)), Faculté de Médecine et de Sciences Biomédicales de Yaoundé ([www.fmsb.uninet.cm](http://www.fmsb.uninet.cm)) Faculté de Sciences ([www.uy1.uninet.cm/index.php?option=com\\_content&view=category&layout=blog&id=57&Itemid=76](http://www.uy1.uninet.cm/index.php?option=com_content&view=category&layout=blog&id=57&Itemid=76))

**Yaounde** has a scientific partnership with the French consortium Sud Expert Plantes<sup>6</sup>. The focus of this particular project is the study of the endemism and the conservation of Orchidaceae and Rubiaceae in Atlantic Central Africa. There is also a research cooperation between the **University of Yaounde 1**<sup>7</sup> and the University of Dortmund, Germany on medicinal plants, particularly on rheumatic applications<sup>8 9</sup>.

In these cases, it is possible that GR have been exchanged for conservation purposes. This is relevant to ABS, as fundamental research is often a starting point for the economic valorization of GR. In addition, a Cameroonian researcher focusing on nutrition at the '**Université de Yaoundé 1**' was also identified as a patent holder and another one, Head of the Department of Chemistry, demonstrates a relatively high record of scientific publications<sup>10</sup>.

There are also three national public research centers (The Institute for Agricultural Research for Development<sup>11</sup> (**IRAD**), Institut médical et des plantes médicinales<sup>12</sup> (**IMPM**), **The Biotechnology Center Nkolbisson**<sup>13</sup> - University of Yaounde 1) for which only broad mission statements are reported which may or may not be involved in the utilization of GR.

#### Other actors

At the regional level, there are actors working on biodiversity and possibly to some extent on GR, mostly in the areas of conservation, agriculture and forest. Interestingly, there are three institutions pooling different stakeholders with a view to improve and share scientific knowledge related to biodiversity. This means that they are likely to exchange genetic material for conservation and R&D purposes with regional partners. These are: **PRASAC**<sup>14</sup> for agronomy, **CARPE**<sup>15</sup> for deforestation and **RAPAC**<sup>16</sup> for protected areas.

Two international actors are of relevance. The **Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles**<sup>17</sup> (CORAF) finances a project for the sustainable management of non-timber forest products, and **Bioversity International**<sup>18</sup> conducts research on GR for food and agriculture purposes. They do not formally use GR but some of their research activities may involve the utilization of GR.

There is also one regional actor, the **West and Central Africa Regional Office**<sup>19</sup> (ICRAF) that promotes the cultivation of high-value plants. It may be relevant to the utilisation of GR as its researchers work

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<sup>6</sup>The first phase of Sud Expert Plantes (SEP) focused on taxonomy and fundamental research. The current and second phase Sud Expert Plantes développement durable (SEP2D) concentrates on operational implementation within the framework of REDD +, the Nagoya Protocol and the Global Strategy for Plant Conservation (GSPC). It will focus on projects that have a strong impact for REDD + and / or participate in the enhancement of plant biodiversity. Partnerships will be developed with the private sector. See [www.sud-expert-plantes.ird.fr/](http://www.sud-expert-plantes.ird.fr/)

<sup>7</sup> [www.uy1.uninet.cm](http://www.uy1.uninet.cm)

<sup>8</sup> <https://www.daad.de/medien/hochschulen/regional/afrika/welcome/dok/tu-dortmund-netzwerktreffen-2012.pdf>

<sup>9</sup> <http://cen.acs.org/articles/92/i39/Tramadols-Newfound-Natural-Product-Status.html>

<sup>10</sup> [http://www.researchgate.net/profile/Simeon\\_Kouam](http://www.researchgate.net/profile/Simeon_Kouam)

<sup>11</sup> [www.irad-cameroon.org](http://www.irad-cameroon.org)

<sup>12</sup> [www.minresi.net/minresi/index2.php?cat=impm](http://www.minresi.net/minresi/index2.php?cat=impm)

<sup>13</sup> <http://fogartyfellows.org/program-overview/cameroon>

<sup>14</sup> PRASAC aims to bring together agricultural research systems of the three partner countries - Cameroon, Central African Republic and Chad - on issues common to the savanna areas. [www.prasac-cemac.org/](http://www.prasac-cemac.org/)

<sup>15</sup> The objective of CARPE is to reduce the rate of forest degradation and loss of biodiversity in the Congo Basin by increasing local, national, and regional natural resource management capacity. <http://carpe.umd.edu/about/index.php/?tab=0>

<sup>16</sup> It has the mandate of COMIFAC (Commission for the Forests of Central Africa) for the application of axis 4 of the subregional convergence plan, on the conservation of biodiversity. [www.rapac.org](http://www.rapac.org)

<sup>17</sup> [www.coraf.org/documents/fiches\\_projets/MDF-Policy\\_Support\\_for\\_Sustainable\\_Use\\_and\\_Management\\_of\\_Non.pdf](http://www.coraf.org/documents/fiches_projets/MDF-Policy_Support_for_Sustainable_Use_and_Management_of_Non.pdf)

<sup>18</sup> [www.bioversityinternational.org/](http://www.bioversityinternational.org/)

<sup>19</sup> <http://icrafwca.org/>

with communities to select species from their natural habitats and adapt them for cultivation. However, as the area of commercialization of the final product is blurred, it is unclear if these R&D activities are covered by Multilateral System of the FAO Treaty (MLS) of the International Treaty on Plant Genetic Resources (ITPGRFA) or by the NP.

There is limited information available on private sector actors in Cameroon which may be involved in the utilization of GR. Very few companies operating in the medicinal plants and forest sectors could be identified. However, of particular relevance to this study, two companies exporting *Prunus Africana* and two private laboratories doing R&D on Cameroon medicinal plants were identified. **SEXPRO**<sup>20</sup> and **AFRIMED**<sup>21</sup> are exporting companies of biological resources; they are both involved in the Prunus export and primary processing. They have already participated in training workshops of the ABS Initiative. **Laboratoire Kamsu Kom**<sup>22</sup> made a demand for funding in 2011 in order to move a project from the R&D phase to production. **Labothera**<sup>23</sup> aims to promote Cameroonian medicinal plants. It would seem pertinent to further examine these enterprises.

### 2.2.3. Actors of the support environment

A few domestic actors were identified which seem to contribute and/or support the valorization of biological resources and possibly GR:

- An **association of traditional healers** was identified, however no information on its activities was available
- A nonprofit organization aiming to bring biotechnology closer to students (**Molecular biology centre**<sup>24</sup>)
- A few conservation NGOs promoting economic development based on biodiversity conservation (e.g. Bioresources Development and Conservation Program-Cameroon<sup>25</sup>, The Environment and Rural Development Foundation - **ERuDeF**<sup>26</sup>, Phytobiotechnology Research Foundation - **PRF**).

Certain actors could potentially contribute to the valorization of GR. For example, it is interesting to note that a forum of entrepreneurs (**Entreprises du Cameroun**<sup>27</sup>) addresses wider sustainability and development issues. Therefore, it may be worth exploring whether they could provide an avenue to engage with the private sector on ABS.

Finally, '**Le Pôle de Compétence en Partenariat (PCP) Grand Sud Cameroun**<sup>28</sup>', is a platform established in 2002, which now includes a hundred researchers, teachers and representatives of civil society. Its objective is to support the management of family farms in tropical agroforestry systems in

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<sup>20</sup> [www.cites.org/common/prog/african-cherry/4-Cameroun.pdf](http://www.cites.org/common/prog/african-cherry/4-Cameroun.pdf)

<sup>21</sup> [www.cites.org/common/prog/african-cherry/4-Cameroun.pdf](http://www.cites.org/common/prog/african-cherry/4-Cameroun.pdf)

<sup>22</sup> [www.frequency.com/video/business-opportunity\\_labo\\_kamsu-kom/50456171/-/5-671666](http://www.frequency.com/video/business-opportunity_labo_kamsu-kom/50456171/-/5-671666)

<sup>23</sup> <http://ekolab.free.fr/04kisomnou.htm#kesako>

<sup>24</sup> <http://molbiocam.org/?m=ResearchFocus>

<sup>25</sup> It is a platform for a collaborating group of scientists, environmentalists, industrialists and organizations participating in the development of biodiversity conservation initiatives which link the development needs of local communities with sustainable natural resources management. [www.bdcpcameroun.org/fr/biodiversity](http://www.bdcpcameroun.org/fr/biodiversity)

<sup>26</sup> [www.erudef.org](http://www.erudef.org)

<sup>27</sup> [www.patronat-ecam.org/missions.ph](http://www.patronat-ecam.org/missions.ph)

<sup>28</sup> <http://ur-bioagresseurs.cirad.fr/content/download/4297/31961/version/1/file/PCP.pdf>

South Cameroon. The IRAD, universities of Yaoundé 1 and Dschang, and CIRAD are the founding members. Since then, other partners have joined. This indicates a capacity for stakeholders to collaborate, which is a key success factor for activities related to ABS and the valorization of biodiversity and GR. This platform seems to bring together an interesting pool of stakeholders to promote the valorization of BR/GR and ABS issues.

### 2.3. Key findings

There are two key findings arising from the identification of actors involved in activities related to R&D and the valorisation of GR, which may utilize GR.

First, there are actors active at the international and regional level in the Congo basin on research projects related to agronomy and biodiversity that may exchange and valorize GR.

Secondly, at the national level there are no official provider of GR but a number of potentially relevant national actors involved in research activities, who are likely using GR, (i.e. 13 universities, two public research institutions, two private companies) do arise. In particular, the breadth of the R&D taking place in the universities is a positive feature. There are also two companies exporting *Prunus Africana* that have been trained on ABS. One individual, the Head of the Department of Chemistry at the University of Yaounde 1<sup>29</sup> arises with high level expertise in one specific research area. The R&D capacity of these national institutions and their level of engagement with foreign actors is also unclear.

Finally, few actors identified demonstrate some potential to improve the business environment for the valorization of GR (one business association, one multi stakeholder project, four NGOs, one of which is active on ABS). However, as overall limited information was available, it is difficult to draw any conclusions regarding their potential effectiveness in promoting the valorization of GR in Cameroon.

## 3. Biodiversity in the patent system for Cameroon: overview of the economic potential of the species

The separate study on the countries' biodiversity in the global patent system: Cameroon available at: [http://www.abs-initiative.info/fileadmin/media/Events/2015/The Echinops ABS Case/Cameroon Country Report 14072013\\_complete.pdf](http://www.abs-initiative.info/fileadmin/media/Events/2015/The_Echinops_ABS_Case/Cameroon_Country_Report_14072013_complete.pdf). It presents the results of the analysis of patent activity for the country's GR and TK. Key insights are drawn from this patent study, related to the economic potential of species.

### 3.1. Species that are known to be distributed in Cameroon and elsewhere

GBIF<sup>30</sup> indicates 15 988 record of species for Cameroon. In total, 1592 species names that are known to occur in Cameroon were identified in the patent data from the major jurisdictions (e.g. North America, Europe, Japan).

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<sup>30</sup> The Global Biodiversity Information Facility (GBIF) is an international open data infrastructure, funded by governments. It allows anyone to access data about all types of life on Earth, shared across national boundaries via the Internet.

*This reveals that species of relevance to Cameroon are a focus of research and development in genetic engineering, pharmaceuticals, biocides, new agricultural plants, cosmetics, foodstuffs and detergents. These research and development activities encompass organisms across the spectrum from plants to animals, bacteria and viruses. In some cases the organisms are a target of activity, such as pathogens or agricultural pests, while in others they are a focus for the development of medicines, foodstuffs, cosmetics or research tools in biotechnology (Oldham P, et al. 2013).*

### **3.2. Species that were directly sourced from, or potentially originate from, Cameroon based on distribution data.**

In total, 22 species were identified that were directly sourced from or are likely to originate from Cameroon (amongst these, eight were examined to link the patent documents to value chains and markets). They are mostly plantae with markets in the pharmaceutical sector but also in genetic engineering and enzyme use to synthesize compounds. Some species are the focus of activity for a range of different products, technology and markets across different sectors. The analysis based on patent citations, revealed one species where there is indication of further economic potential connected to the patented inventions (*Aframomum aulacocarpos* for antiparasitic compounds).

## **4. Links between patent documents, value chains and markets**

Out of the 22 species identified, potentially originating from Cameroon, eight species were selected to illustrate different types of commercialisation and to further explore the economic potential of the species. The table in annex four presents the patent documents with all the information identified on the status of the R&D and linkages with value chains and markets. Based on this data, a summary table of the patent documents examined is presented below.

In some cases this assessment uncovered additional information on the current R&D and commercial developments that can be of interest for future exploration of the economic potential of the species or the specific GR, which are also presented below, with full details in the annex.

Finally, the existence of traditional knowledge (TK) related to the species was also reported. This information was either obtained from the patent document or incidentally found during the internet search. It is important to note that the information is only about the existence of TK on the species and it is not specifically related to the innovation. However, it can be of interest for future exploration of the economic potential of the TK associated to the species.

### **4.1. Methodology**

An internet search was conducted in order to link patent documents to value chains and markets. This consisted of the following steps:

- The analysis of the country' biodiversity in the global patent systems provides a list of patent documents of potential economic interest as they directly relate to Cameroon (see separate study on the countries' biodiversity in the global patent system: Cameroon

- From this list, eight species, found in over 200 patent documents<sup>31</sup>, were selected using the following criteria:
  - The species that were most referred to in the patent documents, or that had a high number of patent citations<sup>32</sup> or large patent families<sup>33</sup> were analyzed in priority
  - When there were too many patent documents to examine for a same species, either a focus was given to those held by the patent assignees that hold the majority of them or in some complex cases a random selection was realized
- Finally, nine patent documents (spanning across the eight species) were selected
- Each patent document was then analysed in two phases:
  - First, in order to understand what the innovation is about, a thorough understanding of the patent document was necessary. For this purpose the analysis focussed on some sections of the patent document: title, abstract, main claims and prior art.
  - Secondly, an internet search was conducted in order to identify the status of the R&D and the presence of the GR in a value chain or on a market. For this purpose, specific key words were used (e.g. the species name, the patent assignee, the inventor, the innovation patented and the targeted market)
- When no product, service, or ongoing R&D could be found, a second search was done by visiting the patent assignee's website to identify potential R&D hints
- Finally, the following classification, with a basic Yes / No / Unclear categorisation, was devised to indicate the degree of linkages with a value chain or a market :
  - Evidence that a product or service is marketed or under active R&D (code : yes)
  - Presumption that a product or a service is marketed or under active R&D but there is no clear evidence (code : unclear)
  - No information could be found about a product, a service or active R&D (code : no)

One limitation of this approach is that it mostly allows to access information regarding marketing activities in the 'business to consumer' segment, as information is often publicly and readily available. Other types of commercialization protected through licenses and trade secrets for example in the 'business to business' segment are difficult to capture because they are seldom publicly available. Furthermore, in many cases it was difficult to confirm the presence of a species in a product due to corporate marketing practices that rarely disclose such information (e.g. rebranding of species active molecule, trademarks). Also, in some jurisdictions companies are not legally required to disclose the product's list of ingredients.

#### **4.2. Linking patent documents to value chains and markets**

The eight species (covered in the nine patent documents examined) are the focus of development of products in the pharmaceutical and functional food sectors. They were analysed in order to identify linkages with value chains and markets.

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<sup>31</sup> Two reasons explain the difference between the number of species and the number of patent documents. First, different organisations can hold a patent document on a same species. For instance, there are over 10 public and private actors holding a total of 186 patents for *Nocardia transvalensis*. Secondly, an inventor generally seeks to protect its innovation at different points in time as its R&D progresses and also diversifies.

<sup>32</sup> The more often that a patent is cited by later patents is a measure of importance and impact of that patent within the patent system.

<sup>33</sup> A patent family is a set of patents that links back to an original parent filing.

For four patent documents, the innovation was found to clearly be linked to a market or a value chain with a final product. These are the patent documents for: a) *Pausinystalia yohimbe*; b) *Cissus quadrangularis*; c) *Ancistrocladus korupensis*; and d) *Allanblackia floribunda*, *Allanblackia gabonensis*, *Calophyllum inophyllum*. For *Cissus quadrangularis*, a scientific article from Cameroons scientists shows the use of *Cissus quadrangularis* formulation in the management of metabolic syndrome, particularly weight loss and central obesity (Oben et al. 2006). It was also possible to link a patent document to one of these scientists as the inventor, while the company Gateway Health Alliance is the patent assignee.

For the other five patent documents no commercial outcome or ongoing R&D was found (i.e. *Aframomum aulacocarpos*, *Nocardia transvalensis*, *Pygeum africanum*, *Vismia laurentii*). However, for two of these patent documents (i.e. *Pygeum africanum* and *Nocardia transvalensis*), although providing no links to a value chain, a market or on-going R&D could be identified, the relatively high number of citations in other patent documents indicates that there may be potential economic interest from other users.

It is also interesting to note that in five patent documents there is TK related to the species (i.e. *Aframomum aulacocarpos*, *Cissus quadrangularis*, *Pausinystalia yohimbe*, *Pygeum africanum*, *Vismia laurentii*). However, the link between the TK and the invention disclosed in the patent document was not in the scope of this assessment.

Finally, the research also uncovered that two species have been widely studied in the context of ABS, (i.e. *Prunus Africana*, *Ancistrocladus korupensis*). According to a report dating from 1998, on access and benefit sharing practices implemented for these 2 species, lessons learned from both cases revealed contrasting benefit sharing in the pharmaceutical and phytomedical sectors. For instance, for *Ancistrocladus korupensis* R&D was initiated on its potential effect on HIV but it was eventually stopped due to toxicity. Although some non-monetary benefits were shared, an ABS agreement was never concluded. The report called for different benefit sharing requirements for each industry taking into account the users’ constraints. For further information, please refer to the report<sup>34</sup>. A next step could be to update the analysis of these two cases, better reflecting current R&D practices and challenges, in order to draw further findings.

Species	Spatial origin of the species <sup>35</sup>	Methodology to analyse the patent document	Kingdom	Link between the patent document and a value or a market	Sector	Traditional knowledge on the species
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<sup>34</sup> For further information see UNEP case study [www.cbd.int/doc/meetings/cop/cop-04/information/cop-04-inf-25-en.pdf](http://www.cbd.int/doc/meetings/cop/cop-04/information/cop-04-inf-25-en.pdf)

<sup>35</sup> This column indicates if the patent document directly refer to the species as originating from the country (Cameroonian origin) or if distribution data suggest that the species is distributed in other countries (Distributed in other countries).

Pausinystalia yohimbe	"Not specified"	There are a number of different assignees utilising this species mainly in research on therapeutic and medicinal uses. The research was carried out for one patent document.	Plantae	Yes	Pharmaceutical	Yes
Nocardia transvalensis	Distributed in other countries	There are a total of 186 patent documents for this species. The research focused on Lilly & Co Eli and Metanomics GmbH because they have the highest number of patent documents.	Bacteria	No	Pharmaceutical	No information found.
Vismia laurentii	Distributed in other countries	There is one patent document.	Plantae	No	Pharmaceutical	Yes
Cissus quadrangularis	Cameroonian origin	There are 14 patents documents for this species. All but one belongs to the same patent assignee, which was the focus of the analysis.	Plantae	Yes	Functional food for health	Yes
Ancistrocladus korupensis	Cameroonian origin	There are nine patent documents held by different assignees. The analysis focused on one assignee which patent document has the most citations (85).	Plantae	Yes	Pharmaceutical	No information found.
Pygeum africanum	Cameroonian origin	There is one patent document.	Plantae	No	Pharmaceutical	Yes
Aframomum aulacocarpos	Cameroonian origin	There is one patent document.	Plantae	No	Pharmaceutical	Yes
Allanblackia floribunda; Allanblackia gabonensis; Calophyllum inophyllum	Cameroonian origin	There is one patent document. A focus was done by crossing the key word 'xanthone' with the patent assignees' name.	Plantae	Yes	Pharmaceutical	Unclear

Table 1: links between species in the patent documents with value chains and markets

#### 4.3. Wider industrial and scientific information related to the patent document(s)

Based on the internet research conducted it would seem that some species have economic potential beyond the value chain and markets identified in relation to the patent documents. As identified on the internet, some species are sold on-line as an ingredient for various products. Others are potentially subject to on-going research, especially in the pharmaceutical sector.

No particular additional conclusions can be drawn from this information with regard to the valorization of GR, as it is unclear if these products or R&D are based on the GR. There is however a clear indication of the economic potential of the species. Hence, the following cases are of potential interest for further exploration:

- The species is an ingredient or a product sold on-line

- *Cissus quadrangularis*: many weight-loss products containing the species are sold on-line. It is also used in sports and athletics nutrition products for its general analgesic properties, including a reduction in tissue soreness and inflammation.
  - *Pygeum africanum*: many nutrition products for prostate health containing *Pygeum africanum* are available in the EU market and can be bought on-line without medical prescription.
  - *Pausinystalia yohimbe*: many products are sold on-line. Before the commercialisation of Viagra, P. Yohimbe was commonly used to treat male sexual dysfunctions. The bark is also used in food supplement for bodybuilding performance.
- The species is potentially under active R&D
- *Aframomum aulacocarpos*: There are some fifty species of *Aframomum* in Africa, about half of them are found in the Cameroon-Gabon region. Some extracts and compounds from this genus have been screened for biological activities including: antifungal, cytotoxic, antibacterial, insect repellent, antiplasmodial, antihypercholesterolemic and antiviral activities (Adjalien et al., 2014).
  - *Vismia laurentii*: Some extracts of the plant are under research to treat cancer, as well as for the antimicrobial and anti-malarial activities (Nguemaving et al., 2006).

#### 4.4. Key findings

Considering the small number of species analyzed, only preliminary conclusions can be drawn. Generally, these cases confirm that R&D is currently taking place on species found in Cameroon and that in some cases the patent documents can be linked to concrete products on the markets.

The R&D is concentrated in the pharmaceutical sector and on plantae species. The species are mostly used in the 'business to consumer' segment (e.g. anti-cancer agent). This may be explained by previous bio-prospection projects for pharmaceutical purposes that took place in the Congo basin. All the patent applicants are foreign companies. In one case, for *Cissus quadrangularis*, it was possible to link a patent document to a Cameroonian inventor, a scientist from the University of Yaoundé. There is however no information available on the potential (Cameroonian) partners or providers of the GR to these foreign actors.

With regard to ABS, there is some experience at the national level, with *Ancistrocladus korupensis* and *Prunus africana*, which were the subject of ABS negotiations. These two cases have been well studied at the international level<sup>36</sup>. A next step could be to update the analysis of these two cases as we can learn a lot from longer term approaches to historic cases, especially in order to draw further findings by examining current R&D practices and challenges.

Finally, internet research provided evidence that beyond the innovation protected in the patent documents, some species are commercialized online or are under R&D. However, it is unclear if there

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<sup>36</sup> For further information see UNEP case study <https://www.cbd.int/financial/benshar/ing/cameroon-phar.pdf>

is utilization of GR in terms of the NP and therefore if they should be considered as a raw material or as a GR under the ABS framework. However, this clearly indicates the economic potential of the species.

## Conclusion and recommendations

This study shows that there is ongoing R&D on the country’s biodiversity and that GR are of value for public and private actors doing R&D across different sectors. There are therefore potential economic opportunities to further valorize Cameroonian GR.

Concretely, the analysis of the patent documents on Cameroonian species - where there is utilization of GR – allowed to identify concrete links with value chains, markets or on-going R&D. The analysis of actors provides a clearer picture of the institutions related to biodiversity conservation and to the valorization of biological and genetic resources. However, due to the lack of information publicly available, it is not possible to determine with certainty: a) which Cameroonian actors are clearly using to GR and b) which actors provided the genetic material used for the R&D related to the patent documents. Hence, based on the information available, it is impossible to establish a link between identified users and potential providers. This could be further researched in next steps.

This however allows to draw a range of strengths and weaknesses with regard to R&D on GR and their economic valorization. While the specific threats were not in the scope of this research, a range of opportunities arise for Cameroon to progress in the strategic valorization of its GR.

The table two below presents the country’s strengths and weaknesses with regard to R&D on GR and their economic valorization. The strengths relate to features that were identified in this report. The weaknesses relate to characteristics that are clearly missing.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>- High biodiversity</li> <li>- Diversity of national actors doing R&amp;D including two institutions doing biodiversity inventory; a key starting point leading to the identification of economic valorization opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>- Clear ABS procedures</li> <li>- Sufficient support to the business environment for the valorization of GR</li> </ul>

<ul style="list-style-type: none"> <li>- Country's experience on bio-prospection and high profile ABS case studies</li> <li>- Diversity of foreign actors doing R&amp;D on the country's GR (e.g. regional actors in Congo basin)</li> <li>- A multi-stakeholder program on agricultural research (e.g. Pole de Compétence Partenariat) is a good basis for learning lessons as partnership is a key feature of modern R&amp;D</li> </ul>	
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Table 2: Strengths, weaknesses for R&D and to valorize GR under the ABS framework

Despite a number of weaknesses, there are a range of strengths that tend to positively position the country to valorize its GR. The country has a diverse range of actors involved in R&D and potentially utilizing GR. However the minimum set up required for their effective and efficient valorization appears rather limited. In summary, there is a good basis for doing research, however the capacity to transit towards the development phases seems rather limited. In light of the information available, it is impossible to come to any definite conclusion.

Some key elements for the efficient valorization of GR could be further explored in order to inform the analysis of the strengths and weaknesses. These are:

- Valorization of TK as it often appears in the patent documents
- Level of scientific expertise (e.g. scientific publications)
- Capacity of national R&D actors to respond to users' R&D requirements
- Capacity to transit from the research to the development phases (e.g. stable production for industrial phase)
- Lessons to learn, obstacles to overcome and potential partners may also be drawn from further exploring the links between patent documents, value chains and markets.

This set up nevertheless does offer a range of opportunities for Cameroon to valorize its GR for bio-prospecting and R&D:

- The wide spectrum of R&D activities undertaken by universities (e.g. nutrition, cosmetics and pollution control) is a positive foundation to explore connections with the users' R&D needs
- Activities at the regional level could be further explored to identify R&D synergies where partners put together their core expertise
- 14 species identified in the patent documents study were not covered in this country assessment. A similar exploration to the one carried here on the links with value chains and markets could uncover other economic opportunities.

Overall, this raises two key questions for the public policy on ABS and the economic valorization of GR. First, in practice, how to close the gap in order to take advantage of economic valorization opportunities related to GR. Second, what are the policy needs to create a favourable institutional and business environment in order to facilitate access to GR and share in fair and equitable manner the benefits arising from their utilization? For this purpose, general recommendations are presented in the synthesis "Economic potential and valorization opportunities for genetic resources in six African countries" for the six countries. However, for Cameroon specific recommendations can be put forward:

### 1) Clarify the Cameroonian actors' needs and constraints to valorize GR in order to continue closing the R&D gap with potential users

Before engaging with users, it is recommended to have a solid understanding of the national actors' aspirations with regard to R&D and the valorization of GR. For instance, what are the priority research areas within the universities in the next decade? Are there existing partnerships with foreign actors? What are the private sector marketing objectives? What are the goals of development and conservation NGOs? Hence, a mechanism or a forum for each priority sector to further support the valorization of GR at the country level could be set up to crystallize the actors' perspectives. Other activities could include to:

- **Update the learning from ABS cases** such as *Prunus Africana* and *Ancistrocladus korupensis*,
- **Gain a wider understanding of the links between patent documents, value chains and markets** by exploring the 14 other species that were not analysed in this project. In particular, consider non plantae species in the 'business to business' segment outside the pharmaceutical sector (incl. genetic engineering, use of enzyme to synthesize compounds).

2) **Clarify the country's trajectory in conserving, using and valorising its biodiversity and GR:** developing an ABS and valorization framework should take into account the country's specific development targets. This could facilitate exchanges between and with national actors and potential users of GR.

3) **A support environment to leverage national strengths on R&D:** Initially, this may call for a mechanism or forum to facilitate exchange of information and partnerships with a view to reinforce the R&D strengths and also address weaknesses (e.g. capacity to transit from research to development phase, and the effectiveness of the support environment in doing so). For instance, lessons could be learned from the experience of the 'Pôle de Compétence en Partenariat (PCP) Grand Sud Cameroun' that pools together the expertise of various stakeholders.

### 4) Benefit-sharing:

- **Encourage the establishment of benefit-sharing requirements that improve the Cameroonian actors capacity to move up the value chain** (e.g. training of local researchers to carry out additional research activities) as most GR only undergo the initial stages of the research phase (e.g. screening), where failure is high. This is in line with the recommendations made in 1998 in the UNEP report on *Ancistrocladus korupensis* and *Prunus Africana*<sup>37</sup>.

In light of the recommendations above, policy makers may wish to consider taking into account these elements for the valorization of BR and GR in the implementation of sector-specific strategies.

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<sup>37</sup> For further information see UNEP case study [www.cbd.int/financial/bensharing/cameroon-phar.pdf](http://www.cbd.int/financial/bensharing/cameroon-phar.pdf)

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## Annex 1: Key words used to identify actors relevant to R&D on GR

Note: traditional knowledge was not in the scope of this institutional analysis.

- a. Generic websites
  - For all countries : World Bank : strategy for developing agriculture in the country, focusafrica.gov.in,
  - For English speaking countries : [www.commonwealthofnations.org](http://www.commonwealthofnations.org)
- b. Generic key words for key stakeholders
  - Chamber of commerce
  - Trade associations and business federation
  - University
  - Herbarium
  - Museum
  - Laboratory
  - Research institutes
  - Botanical gardens
- c. Specific actors (mostly international actors likely to do R&D and use GR from the country)
  - Research (CIRAD, CIFOR, Kew, IRD, Sud Expert Plantes, CBI)
  - Development (FAO, ITCSD, UNDP)
  - Development agencies (AFD, GIZ, USAID)
- d. Types of genetic resource: forest, marine, animal, agricultural, plantae, microbe, microorganisms, bacteria, fungi
- e. Sectors and R&D<sup>38</sup>:
  - Pharmaceutical
  - Biotechnology
  - Horticulture
  - Food : crop improvement, breeding, pest protection, stress resistance
  - Health food : nutraceutical, agro-biodiversity, plant for food and alimentations
  - Cosmetics: Oils, fats and waxes, gums, extracts and saps, colorants, formulation, anti-oxidant
- f. R&D activities, processes and technologies: bio-prospection, raw material, sample, valorization, extraction, metabolic processes, molecular technique, nanotechnology, liquid chromatography devices, nuclear magnetic resonance, spectrometers.

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<sup>38</sup> A focus was put on the health food and cosmetics sectors as they are thought to be the easiest targets for providers of GR to engage with in R&D processes.

**Annex 2: List of the most relevant actors found in the scope of the assessment related to R&D and the economic valorization of biodiversity, biological and genetic resources.**

[Click to view annex 2.](#)

**Annex 3: List of all the actors found in the scope of the assessment related to R&D and the economic valorization of biodiversity, biological and genetic resources.**

[Click to view annex 3](#)

## **Annex 4: List of the patent documents examined for linking species with markets and value chains**

[Click to view annex 4.](#)