ONE WORLD ANALYTICS

# *Biodiversity In The Patent System:*

## *A country study of biodiversity, genetic resources and global patent activity for Burundi*

Prepared for

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

October 2013


Authors

Paul Oldham
Colin Barnes
Stephen Hall



One World Analytics is a trading name of POMC Consulting Ltd. UK

# Introduction

This report presents the results of analysis of patent activity for genetic resources and traditional knowledge from Burundi. The report is divided into three sections:

Section 1 provides an overview of biodiversity in Burundi based on information from the Global Biodiversity Information Facility and introduces the patent data.

Section 2 provides a general overview of patent activity for species known to occur in Burundi in the period 1976-2010. This is followed by detailed analysis of patent documents that make reference to Burundi and data based on species that are limited to distribution in Burundi

Section 3 provides a set of short summaries for species that are a focus of patent activity. This information will also be made available online for further research through the Access and Benefit Sharing Patent Index (ABSPAT).[1]

The report was prepared using large scale text mining of patent data for species names and country names. This data was then combined with taxonomic information from the Global Biodiversity Information Facility. Additional patent research was conducted using the commercial Thomson Innovation database and processed using a variety of software tools.

Patents are an important indicator of investments in research and development directed to the development of commercial products. The aim of the report is to identify potential opportunities for economic development in support of conservation by identifying existing research and development involving species from Burundi. The research did not investigate the terms and conditions under which patent applicants obtained the genetic resources and traditional knowledge disclosed in the patent document. Therefore the report does not consider the problem of biopiracy or misappropriation of genetic resources and traditional knowledge.

The research was initially limited to searches of patent data containing a species name from the United States, the European Patent Office and the international Patent Cooperation Treaty in the period 1976-2010. Additional research was performed to identify and review all patent documents making reference to Burundi published anywhere in the world between 1900 and 2013. As such the report provides a baseline for patent activity involving species from Burundi as a basis for further research.

Our research focused primarily on documents that make reference to Burundi and to cases where existing distribution data suggests Burundi is a likely source for the species. This imposes two limitations on the research. First, we focus on identifying species that are a focus of existing research and development. However, the report does not seek to provide the complete global patent landscape for an individual species. Second, because we focused on identifying species from a country we did not search patent data for references to regions (i.e. Africa) or sub-regions (i.e. Southern Africa) in the patent data. To address this issue we deliberately highlight cases where a species is distributed in more than one African country.

[1] ABSPAT is available at http://www.abspat.net

This report is one in a series of reports on patent activity for species from African countries. The following observations are based on the research for the fifteen African country reports to date and form the main recommendations arising from the research.

**Taxonomic Research:**

1. There is a need to improve the availability of taxonomic information for each country. In the absence of taxonomic information it is not possible to identify genetic resources that are relevant to a particular country in patent data and any relevant opportunities for economic development. African countries could consider giving greater priority to taxonomic research and making taxonomic information available through GBIF.
2. Georeferencing of the coordinates for the locations of species is an important standard in modern biodiversity research. Georeference data can be used to identify where species have been recorded in a country and also where biodiversity research has been concentrated. In our view georeferencing is an under-utilised tool for identifying where species are located as a basis for engaging with indigenous and local communities to consider potential development opportunities. We recommend greater attention to georeferencing and its use for engagement with relevant indigenous and local communities.
3. Taxonomic research does not attract investment because it appears to be remote from economic considerations. In practice taxonomic information is vital to identifying opportunities for development that is supportive of the objectives of the Convention on Biological Diversity and its Nagoya Protocol.
4. Taxonomic information is also important for the capacity of countries to monitor compliance with the Nagoya Protocol by improving baseline data on the species within a country. Advancing knowledge and understanding of biodiversity and the traditional knowledge of indigenous and local communities has an important role to play in long term monitoring under the Nagoya Protocol.

**The Patent System:**

1. Patent documents are frequently unclear on the precise origin or source of genetic resources and associated traditional knowledge. In addition very limited information is available on the terms and conditions of acquisition of genetic resources and traditional knowledge. This could be improved through enhanced disclosure of origin measures as advanced by the African Group and discussed in greater detail elsewhere.[2]
2. Species are commonly distributed in more than one country. It is important that African countries include requirements in access and benefit sharing agreements to clearly specify the source of genetic resources and associated traditional knowledge in any patent applications that may arise under the terms of an agreement. When combined with the enhanced disclosure measures noted above this would greatly improve capacity to monitor patent activity under the terms of the Nagoya Protocol.
3. One of the major issues that emerged in the research is the problem of essential incorporation of species into patent claims. Patent applicants frequently list very large numbers of species, or make reference to genera and families, with the purpose of incorporating all members of a genus or family into the scope of the patent claims. Typically these applications did not involve collection or use of many of the species that are listed. The aim of essential incorporation is to prevent others from using compounds, extracts or ingredients from these species in similar inventions or products. Where granted these patents are likely to have negative consequences for

[2] Oldham, P & Burton G (2010) *Defusing Disclosure in Patent Applications.* UNEP/CBD/COP/10/INF/44

researchers and producers in African countries seeking to develop and export similar products from these species. In our view, patent claims for components of organisms should be limited to the species from which the compound or extract was isolated by the applicants and not extend to members of the genus or entire families. Furthermore, in our view essential incorporation is anticompetitive and action should be considered to stop or severely restrict this practice.

4. In some cases patent activity may involve species that are vulnerable, endangered or CITES listed. In considering the possibilities for economic development identified in patent data it is also important to identify and assess the conservation status of the species concerned in order to support the objectives of the Convention on Biological Diversity.

Patents have frequently been viewed with suspicion within the biodiversity policy community as examples of the inequitable exploitation of resources from biodiversity rich developing countries. Our research demonstrates that patent data can also be turned to positive purposes to identify potential opportunities for economic development in Africa. We hope that this information will prove to be useful to African countries.

# Burundi


**Area:**
27,830 sq. km.
**Coastline:**
Landlocked
**Climate:**
Equatorial
**Geography:**
Burundi is a hilly and mountainous country which drops to a plateau in the East where there are some plains. The country straddles the crest of the Nile-Congo watershed.

**Biodiversity in Burundi and Patent Activity:**

Data for biological diversity was obtained from the Global Biodiversity Information Facility (GBIF). GBIF is an international government-initiated resource that provides open access to the most comprehensive quantitative data of species across time and space presently available. All data is submitted by participating collections who share biodiversity information.

Using this resource we have obtained biodiversity records for species which occur in Burundi. It should be noted that the usefulness of this data in determining the actual distribution of a given species is conditional to the comprehensiveness of the data submitted by GBIF participants. Therefore we would stress that the absence of records should not be interpreted as indicating an absence of a given species, and similarly that a recorded species that only appears from one country should not be regarded as evidence of endemism. All reasonable efforts in identifying endemic species were made from alternative sources during the compilation of this report.

GBIF presently records 3,629 resolved species names for Burundi with 12,154 georeferenced coordinates for the occurrences of these species in Burundi.

We identified a total of 153,752 documents containing species known to be distributed in Burundi. Of these, 18 made some form of reference to Burundi. These documents were manually reviewed in MAXQDA software to identify documents specifying a source or origin in Burundi.

The 18 documents that made a specific reference to Burundi contained one species. These documents were manually reviewed in MAXQDA data analysis software. Through this process we were able to identify species where it was definitively stated that they had been collected, sampled or otherwise obtained from Burundi.

In addition, using GBIF distribution data we searched for species where GBIF presently records distribution only in Burundi. However no such species was identified. The idea behind this was to identify cases where a species (based on available distribution data) was likely to have come from Burundi and thus be regarded as a species of likely or potential significance for Burundi.

Finally, we carried out an additional search across all global patent jurisdictions for any documents featuring the country name Burundi published between 1900 and 2013. This search identified 206 raw documents with 45 documents containing species references which were manually reviewed using MAXQDA software. This search was undertaken to ensure that as much up-to-date data as is available was incorporated into the results. For the sake of simplicity we call this data 'Global 2013'.

**Biodiversity and Distribution**

Much of the data submitted to GBIF includes geographical coordinates indicating where the recorded species was located. A total of 12,154 coordinates were available for Burundi. Using this data we are able to show the physical distribution across Burundi of all GBIF recorded species. Plate 1 shows two maps: The left map shows plotted points, each indicating a GBIF record. The points are coloured to indicate the kingdom to which the species belongs. It should be noted that this geographical information is raw data as submitted to GBIF by participating recorders. It has not been cleaned to remove any human errors when inputting to the GBIF database (an example of such an error might be where a longitudinal coordinate has been recorded as a + rather than a -). The map to the right shows major settlements and roads. It also includes the location of some protected areas such as Kibiri National Park and Ruvubu National Park - places expected to be of significance for biodiversity. A larger version of the distribution map can be found in the appendix of this country report.

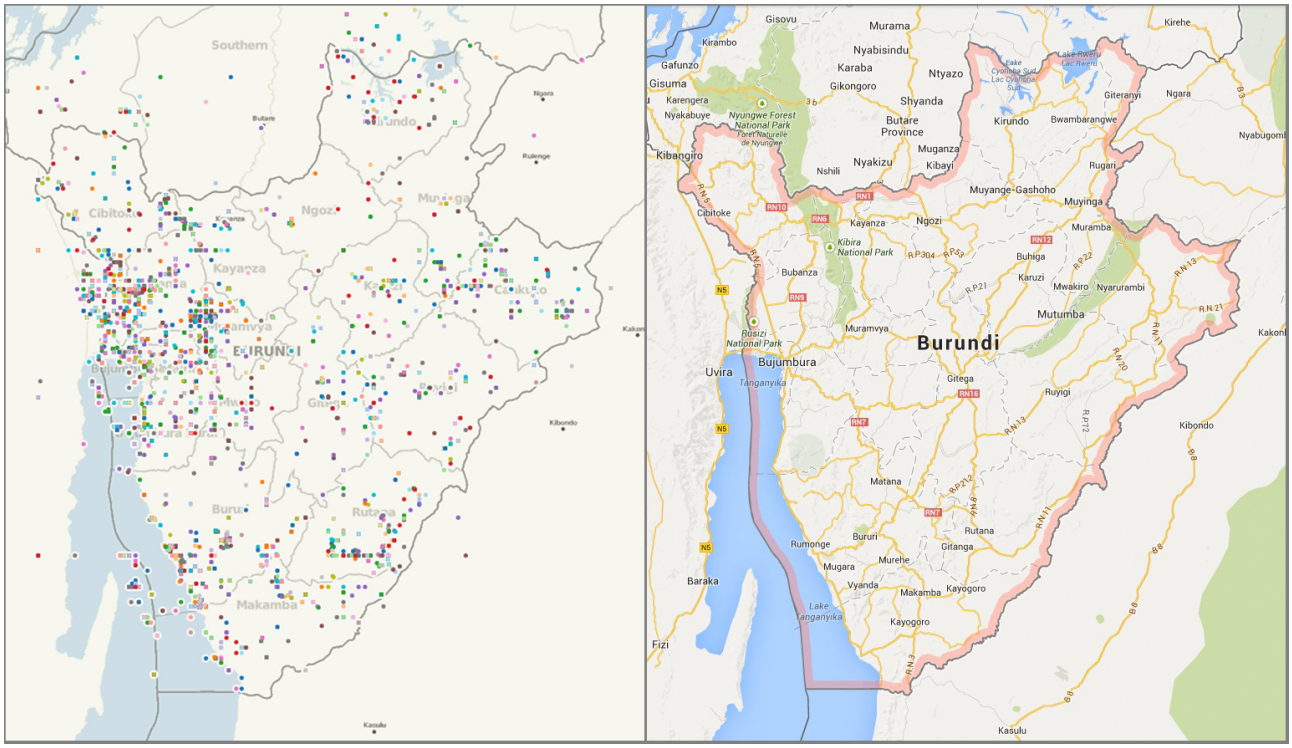



*Plate1: Distribution of GBIF records from Burundi (left) and major settlements and roads (right) (map courtesy of Google Maps). Each colour point represents a species record coloured by kingdom.*

It is very interesting to compare the two maps. The distribution map shows that records are not uniformly dispersed across the country. The majority of records come from the most populous part of the country in the region of Bujumbura and Muramvya, which also includes the Rusizi National Park on the national border with The Democratic Republic of the Congo. Across the remainder of the country the records appear scarce and

widespread. There is very little sign of a pattern in this distribution. This is not surprising as the country is small with a network of roads reaching close to most areas. The South west region along Lake Tanganyika shows a slightly higher density of records and there is some evidence of records being taken along the routes of roads. There are also small clusters of records from Kibiri National Park in the North and Ruvubu National Park to the East. This pattern of records and the relative scarcity of georeferenced locations suggest that extensive recording has been carried out only in the well-populated western area and that the rest of the country has further potential for recording to build an accurate picture of the biodiversity and distribution. We would note that georeferencing of species data has an important role to play in facilitating the identification of where species are located in a country. While caution is required in the case of endangered species we would emphasise the wider importance of promoting georeferencing in enhancing knowledge and understanding of biodiversity in Burundi.

GBIF presently records 4,005 species known to be present in Burundi (this figure includes unresolved names, hence the increase in species from the number quoted above). This list is dominated by plants and animals which account for all but 120 species as can be seen in Table 1. The other kingdoms are poorly represented, and this, perhaps, illustrates a fairly low level of recording and collection.

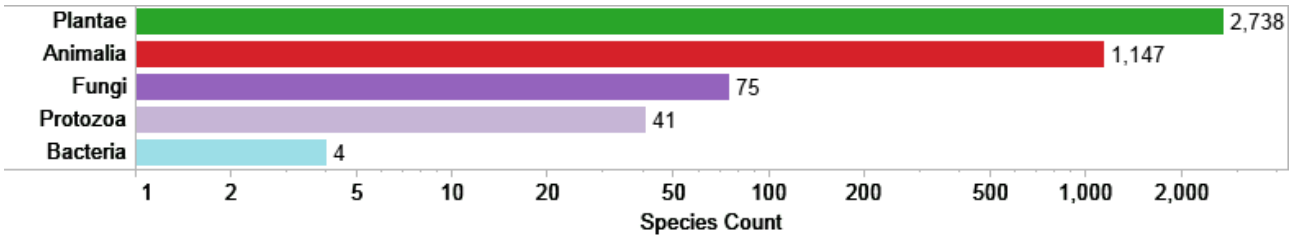



*Table 1: Showing the number of species in Burundi by kingdom using GBIF data.*

Using global data it is possible to examine the wider distribution of Burundian species. Plate 2 shows where records exist across the globe for such species. Species that are found in two or more countries are referred to as ‘cosmopolitan’. Each pie represents the number of species that are found in Burundi in a particular kingdom. It can be seen that a substantial number of species have a very wide regional distribution throughout sub-Saharan Africa and notably in those countries in east Africa which have shared biomes. A smaller number have global distributions, although it should be noted that some of these records may originate from research institutions or collections and therefore do not represent native or naturalised distribution.

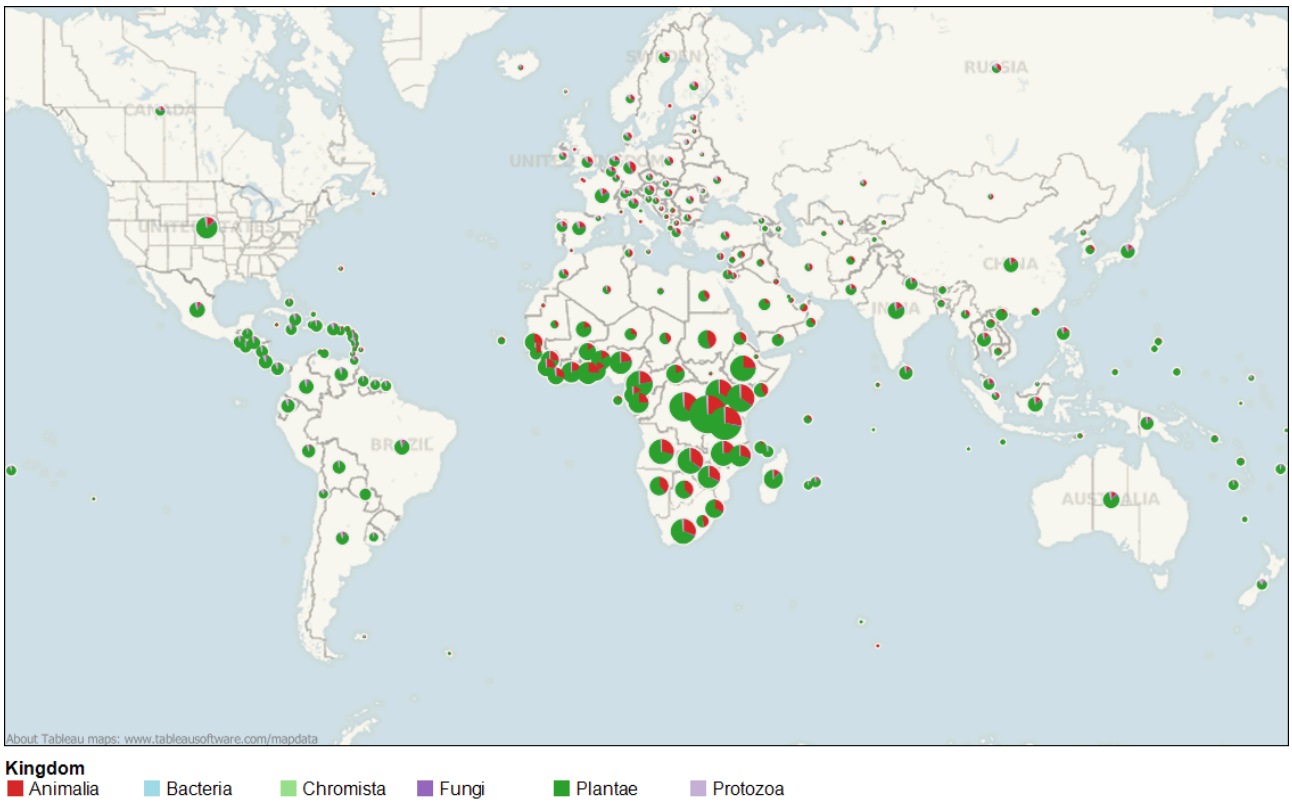



*Plate 2: Global distribution of Burundian species shown by Kingdom and the number of species recorded in GBIF.*

## Biodiversity in Burundi in the Patent System

As of 2013 a total of 175 patent documents in the main patent jurisdictions (European Patent Office, the United States, and the Patent Cooperation Treaty) specifically mention Burundi. This provides a general overview of references to Burundi in the patent system across all areas of invention. Only a proportion of these documents will also refer to species collected in, or sourced from, Burundi. In addition, patent applicants will make reference to species that originate from Burundi but will not mention Burundi as the source of genetic resources or traditional knowledge.

Our aim in this section is to provide a brief overview of patent activity for genetic resources of relevance to Burundi. We focus on patent activity in the main patent jurisdictions in the period between 1976 and 2010. We then examine the results of research to identify genetic resources and traditional knowledge that originate from Burundi. In approaching patent activity for genetic resources from Burundi we focus on three categories of data.

1. Species that are known to be distributed in Burundi but are also distributed elsewhere in the world. This provides an overview of global patent activity for genetic resources of relevance to Burundi.
2. Species where a direct reference is made to the collection or origin of a species from Burundi. This data is based on a review of patents that make reference to a species known to be distributed in the country and the country name.

3. Species where available distribution data suggests that a sample is likely to have originated from Burundi. This data is known as Distribution data and refers to cases where GBIF presently only records a species as occurring in Burundi and no other country. Because taxonomic information is incomplete, this data provides a clue rather than proof that a species originated from Burundi.

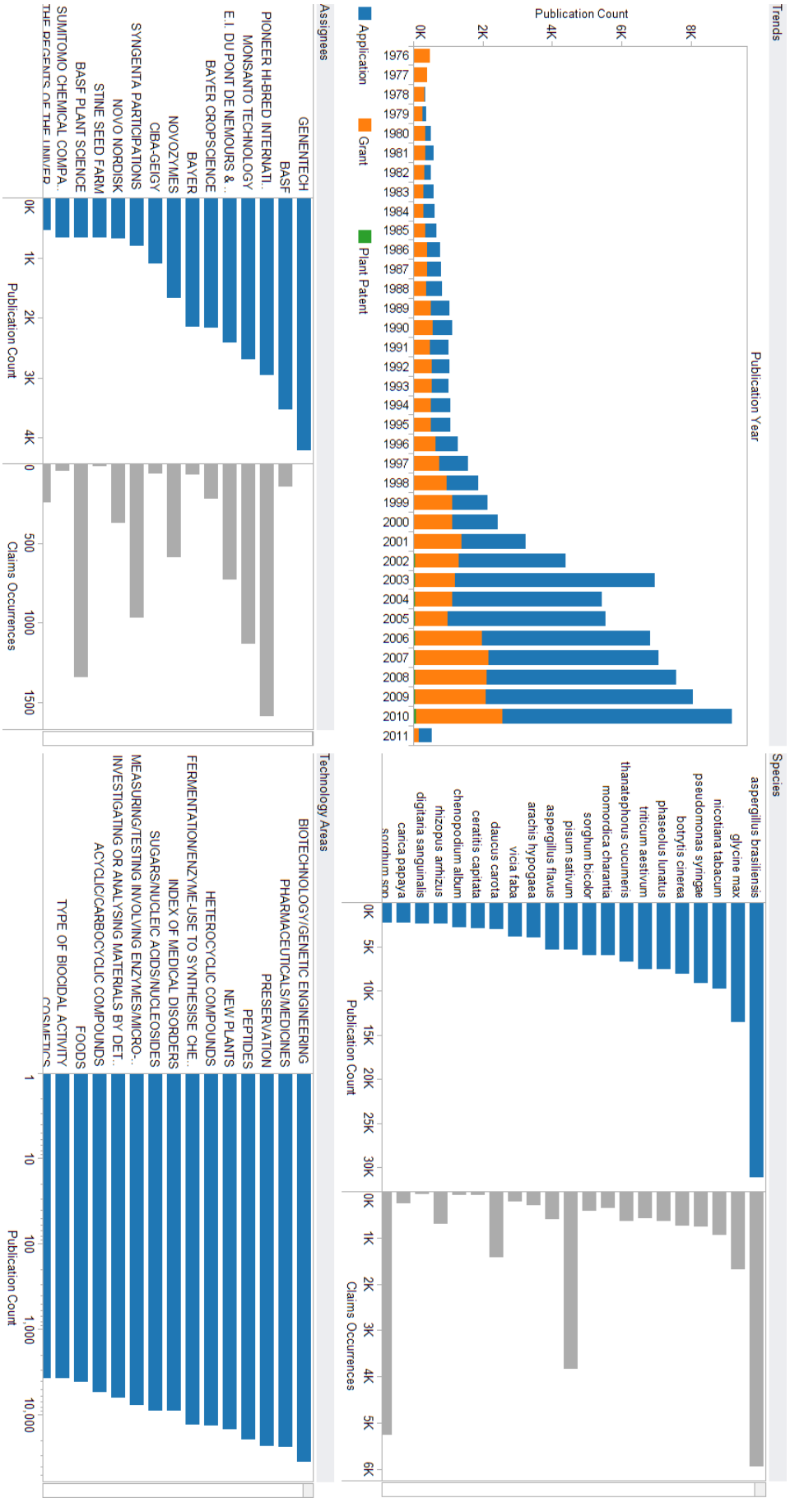
We begin our analysis with an overview of biodiversity that is known to occur in Burundi in the patent system and then turn to data on species originating from Burundi.

Burundi shares a significant proportion of its known biodiversity with other countries in Africa and around the world. Plate 3 provides an overview of patent activity for species that are known to occur in Burundi and other countries around the world. This overview provides information on trends in applications and grants, the top species appearing in patents that are known to occur in Burundi, top applicants or assignees and technology areas.

In total we identified approximately 1,097 species names in patent data from the major jurisdictions that are known to occur in Burundi. When model organisms including crops such as *Zea mays* (maize) and *Homo sapiens* are excluded this falls to 1,020 species names and 729 accepted scientific names.[3] This data is relevant for Burundi because it demonstrates that researchers and companies are conducting research and development on species that are known to occur in Burundi. As Plate 3 makes clear, research and development is taking place across a range of technology sectors and is targeted to a variety of markets.

[3] The 729 figure excludes common model organisms such as E. coli, Arabidopsis thaliana, Bacillus subtilis and Zea mays (maize) that are globally distributed and are used as research tools in biotechnology. These species appear prominently in patent data for all almost countries and are therefore excluded.

*Plate 3: Overview of Patent Activity featuring Species occurring in Burundi.*



The top species of relevance to Burundi in global patent data include species used in biotechnology such as *Aspergillus brasiliensis* (formerly *Aspergillus niger*). In total we identified 575 plant names in global data of relevance to Burundi with crops represented by species including varieties of soya (*Glycine max*), peas (*Pisum sativum*), beans (*Vicia faba* and *Phaseolus lunatus*), peanut (*Arachis hypogaea*), carrot (*Daucus carota*), cereals (*Sorghum spp* and *Triticum aestivum*), papaya (*Carica papaya*) and tobacco (*Nicotiana tabacum*). Other species include the plant pathogen *Pseudomonas syringae, Botrytis cinerea,* a cause of fungal fruit infections, and *Thanetephorus cucumeris,* a fungus which attacks tubers. *Momordica charantia* or bitter melon is grown as a food crop and has pharmaceutical uses. *Chenopodium album* is a plant which can be a crop weed but also a food and fodder crop in some places in the world*. Rhizopus arrhizus* is a fungus which is the cause of mucormycosis in humans. Insects are represented by *Ceratitis capitata*, a fruit fly which causes major destruction to crops.

The assignees in the overall data for species of relevance to Burundi range across a spectrum from biotechnology (e.g. Genentech and Novozymes), companies such as BASF and Bayer in areas such as biocides/insecticides, agriculture (e.g. Du Pont). More detailed analysis of technology areas revealed pharmaceutical companies such as Ciba Geigy and Novo Nordisk which specialises in treatments for diabetes. Also companies which develop new crops such as Syngenta, Monsanto and Stine Seed feature prominently. As this makes clear, there are a wide range of general and specialised technology areas and markets of relevance to biodiversity from Burundi. To gain a more focused view of activity we now turn to the results of research to identify organisms appearing in patents that were directly collected in Burundi or where distribution data suggests that Burundi is the likely source.

**Species from Burundi in Patent Data:**

In total we identified just one species of organism that potentially originated from Burundi. This is shown in Plate 4. In the next section a summary is provided for this species. This data will also be made available online.

Plate 4 reveals that based on detailed analysis of patent documents, just one species appears in the data compared with the overview provided in Plate 3. This species is *Harungana madagascariensis,* a flowering plant in the family Hypericaceae and the sole member of the genus. It has wide distribution across sub Saharan Africa and can be found in both forest and savannah habitats. Shaman Pharmaceuticals Inc of the USA (US5837255A and WO1998025639A1) claim a method for reducing blood glucose by administering harunganin or visimin. The abstract of these applications states: “The use of extracts from Harungana or Vismia spp. or anthracenone compounds harunganin and vismin contained therein or isolated therefrom as hypoglycemic agents, as well as methods for obtaining the hypoglycemic agents are described. According to a preferred embodiment, the extracts are derived from H. madagascariensis. As hypoglycemic agents, the extracts or anthracenone compounds harunganin and vismin are useful for treating insulin-dependent (type I) and non-insulin-dependent (type II) diabetes.”

Although there is no specific claim that the plant used for this particular invention was collected or otherwise sourced from Burundi, the patent description makes reference to traditional knowledge from Burundi thus: “...in Burundi, leaf decoction is used as a bath or as an inhalant to treat epilepsy, leaf decoction used to treat vaginal prolapse, leaf decoction is administered orally to treat coughs and tapeworms, root decoction is used to treat tapeworms.”

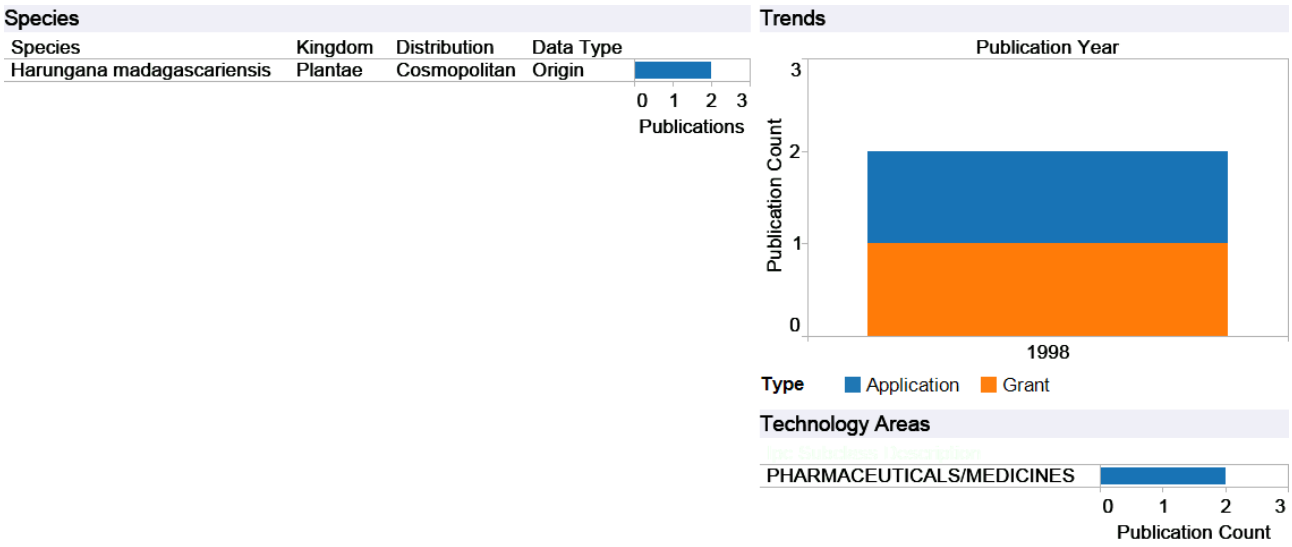



*Plate 4: Species potentially sourced from Burundi.*

Full details of the species identified in the research are provided in the final section of this report. In the case of Harungana it should be noted that references to traditional knowledge included additional African countries. Therefore this example will also be found in the associated reports focusing on those countries. This detail highlights how cosmopolitan species such as Harungana, that are native to several African countries, may hold significant potential for collaboration in economic development and conservation.

Despite the lack of evidence of biological resources sourced from the country it should be noted that Burundi has a significant portfolio of species that appear in patents as can be seen in Plate 3. It is important to emphasise that species may be involved in research and development in different areas of science and technology and may serve different markets. In some cases a species may be the target of a particular invention. In other cases a patent may suggest potential uses of a particular organism while in others, the species will be the direct focus of the claimed invention. We now turn to more detailed analysis of the technology areas involving species relevant to Burundi.

***Technology Areas:***

Table 2 provides a brief summary of the technology areas involved in patent activity for Burundi and is followed by a more detailed breakdown of activity.

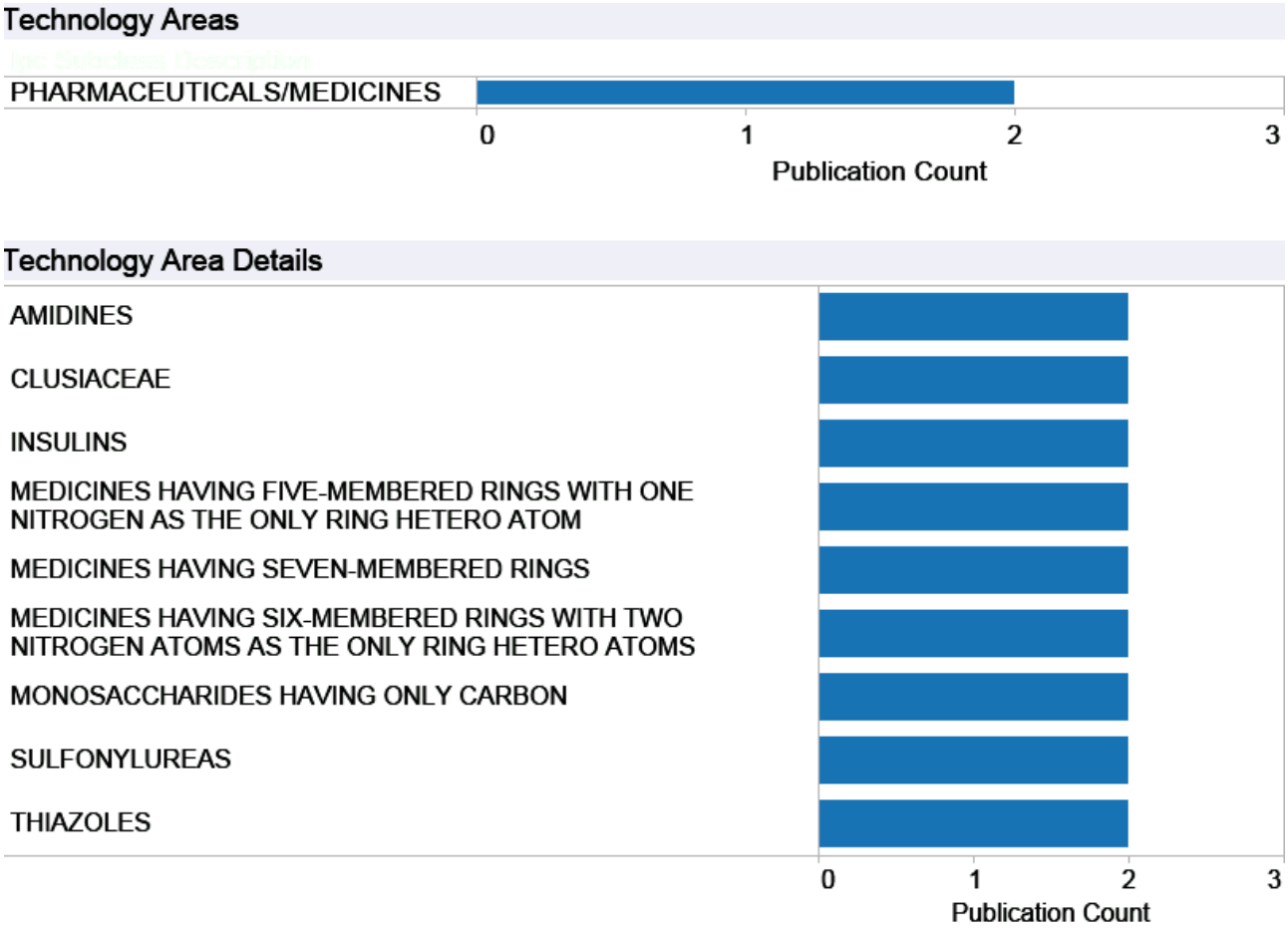



*Table 2: Technology Areas*

The general overview of technology areas provided in Plate 3 emphasised biotechnology and pharmaceuticals. Table 2 shows that *Harungana madagascariensis* is utilised for extracts which can be used in pharmaceuticals. In particular it can be seen from Table 2 that extracts from the plant are used for medical preparations relating to several specific properties of the species.

Table 2 usefully reveals the range of potential applications and technology areas where a species and its components may be deployed. As such, a species may be a focus of activity for a range of different products and markets. However, in the case of threatened species there will be a need for careful stewardship and conservation of target species.

**Patent Claims:**

Additional insights can be provided by examining the types of claims that are being made in relation to the species. A patent application may contain multiple claims but is required to contain only one invention. The first claim sets out the major focus of the claimed invention and frames all other claims.

Patents are awarded for three main classes of invention:

a) Compositions of matter
b) Methods or processes
c) Machines

In some jurisdictions claims may be permitted for new plant varieties either under standard patent legislation or under specific legislation (i.e. US Plant Patents).

Table 3 displays a summary of the top terms appearing in patent claims relating to genetic resources for Burundi.

For claims made in relation to *Harungana madagascariensis* the first claim states “A method for reducing the blood glucose of a mammal, comprising administering to said mammal a hypoglycemically effective amount of a composition comprising harunganin or vismin, or a pharmaceutically acceptable salt thereof.” (WO1998025639A1). This claim clearly states that the claim is for both a method for carrying out a treatment and also a composition using a genetic component. These distinctions will now be discussed.

The first category of patent claims within this document is for methods, such as methods of producing a compound or treatment which leads to a desired outcome. Method claims are frequently more restrictive in their coverage of genetic resources because the genetic component is only claimed in so far that it is relevant to performing the method. That is, it is the method that is the focus of the invention. Therefore it is the method, and the use of the claimed genetic or biological component in performing that method, that is the subject matter of protection.

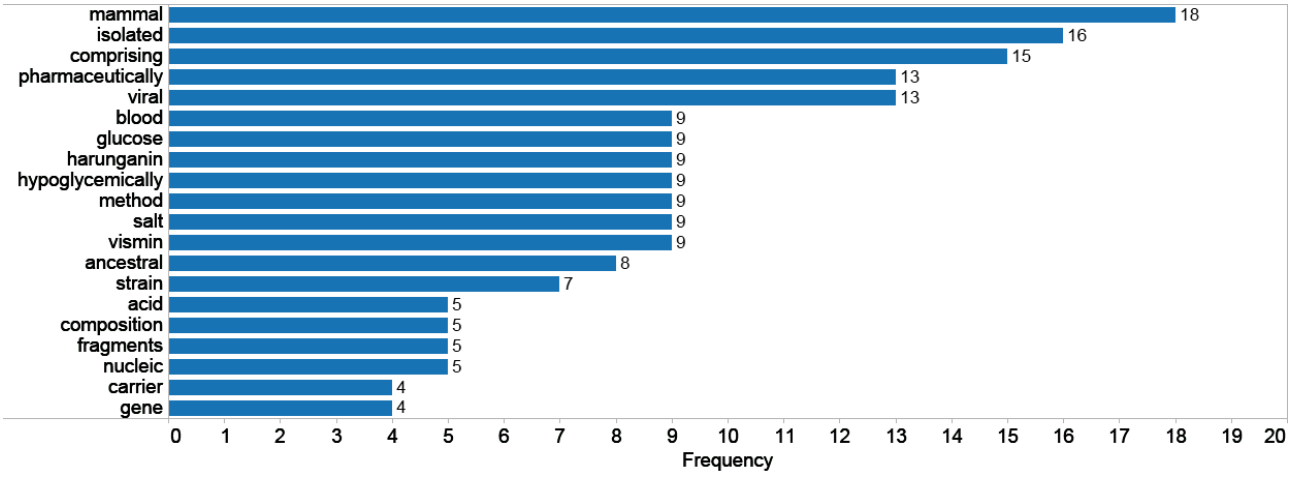



*Table 3: Terms Appearing in the First Claims of Patent Documents*

As part of the method for reducing the blood glucose of a mammal the applicants also claim a composition consisting of material from the species. Compositions are commonly extracts, compounds or combinations of ingredients (e.g. in pharmaceuticals or cosmetics and herbal medicines). In contrast with methods based claims that focus on the use of a composition in a method, patent claims for compositions of matter typically include a list of the compounds or ingredients that are the subject matter for protection. While not directly applicable in this case, composition of matter claims are frequently broadly constructed such that the use of compounds from the species, the genus, and in some cases the

family, are incorporated into the scope of the claims. While composition of matter claims may be constructed in various ways, broad claims may well impinge upon the ability of producers from a country to export products containing the claimed components into markets where a patent is in force.

As this brief discussion of patent claims suggests it is important to pay close attention to both the type and the content of patent claims. In addition, it is important to establish whether a patent has been granted, the jurisdictions where a patent has been granted, and whether it is in force. This type of analysis is particularly important when considering the potential development of products for markets. However, detailed patent analysis such as freedom to operate, patent validity, patentability, patent infringement and patent landscape analysis requires specialist analysis beyond the scope of the present report. Given the increasing importance of these issues for economic development, the World Intellectual Property Organization has established a Patent Landscaping initiative under its development agenda that commissions specialist patent research at the request of member states.[4]

**Global Impacts and Global Markets:**

We have seen above that a range of species are involved in patent activity of relevance to Burundi. However, it is important to note that many patent applications simply go nowhere. They may embody the hopes and ambitions of individuals, researchers, universities and companies but do not ultimately have an impact either in the patent system or in the market. A means for identifying important patents is therefore needed. Here we discuss two measures: a) patent citations, and; b) patent families.

Table 4 displays the citation scores by species and assignee for species relevant to Burundi. When a patent is filed and published it becomes prior art. Later patent applications that make claims for the same invention will find that the scope of what they claim as being new or involving an inventive step, will be limited by these earlier claims. This is recorded in the patent system as a citation. The more often that a patent is cited by later patent applications is a measure of the importance and impact of that patent within the patent system. In some cases a single patent application may attract over a thousand citations (i.e. *Thermus aquaticus* in biotechnology). Patent citation counts are therefore an important measure of the importance of patent activity because these scores reveal the impact of patent activity on other applicants.

In the case of Burundi Table 4 reveals a selection of citation scores for species of relevance to Burundi organised by species and assignee. As can be seen, the species *Harungana madagascariensis* has received two citations.[5] This is a very low score and suggests the patent has not made an impact upon other patent applicants.

---

[4] http://www.wipo.int/patentscope/en/programs/patent_landscapes/

[5] Table 5 aggregates the patent scores by species and assignee. If an assignee has four documents with citations involving the species, the numbers are aggregated to arrive at the total.

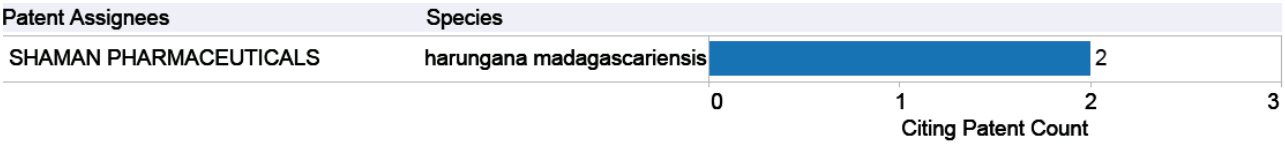



*Table 4: Species and Assignee Citing Patents*

A second measure of the importance of patents is provided by the size of patent families. Table 5 shows the numbers of patent family members. A patent family is simply a set of patent documents that link back to an original parent filing (known as a "priority" filing). These patent documents can be filed anywhere in the world and can be tracked using unique identifiers known as INPADOC numbers that link back to the parent document.[6] In contrast with patent citations that provide an indicator of the impact of a patent on other applications in the patent system, the size of a patent family reveals how important a patent is to applicants. The reason for this is that they must pay fees each time they file a patent application that is linked to the parent (priority) application.

Patent family data of this type is useful in revealing the applicants who are most vigorously pursuing patent protection involving a species, or as is frequently the case, a group of species around the world. In this case Shaman Pharmaceuticals has a family size of just four. As such, this example provides an indicator of the importance to the company of these organisms in innovation. In this case the patent family is also small suggesting that the patent as of limited interest to the company.


*Table 5: Patent Assignees and Patent Families*

As this makes clear, while care is required in analysing why a particular species is referenced in a patent document, it is possible to trace the economic importance of particular patents to patent applicants using patent family data.

This type of analysis can be extended to the species level to consider the global impacts of patent activity and the position of patents involving a species in global markets.

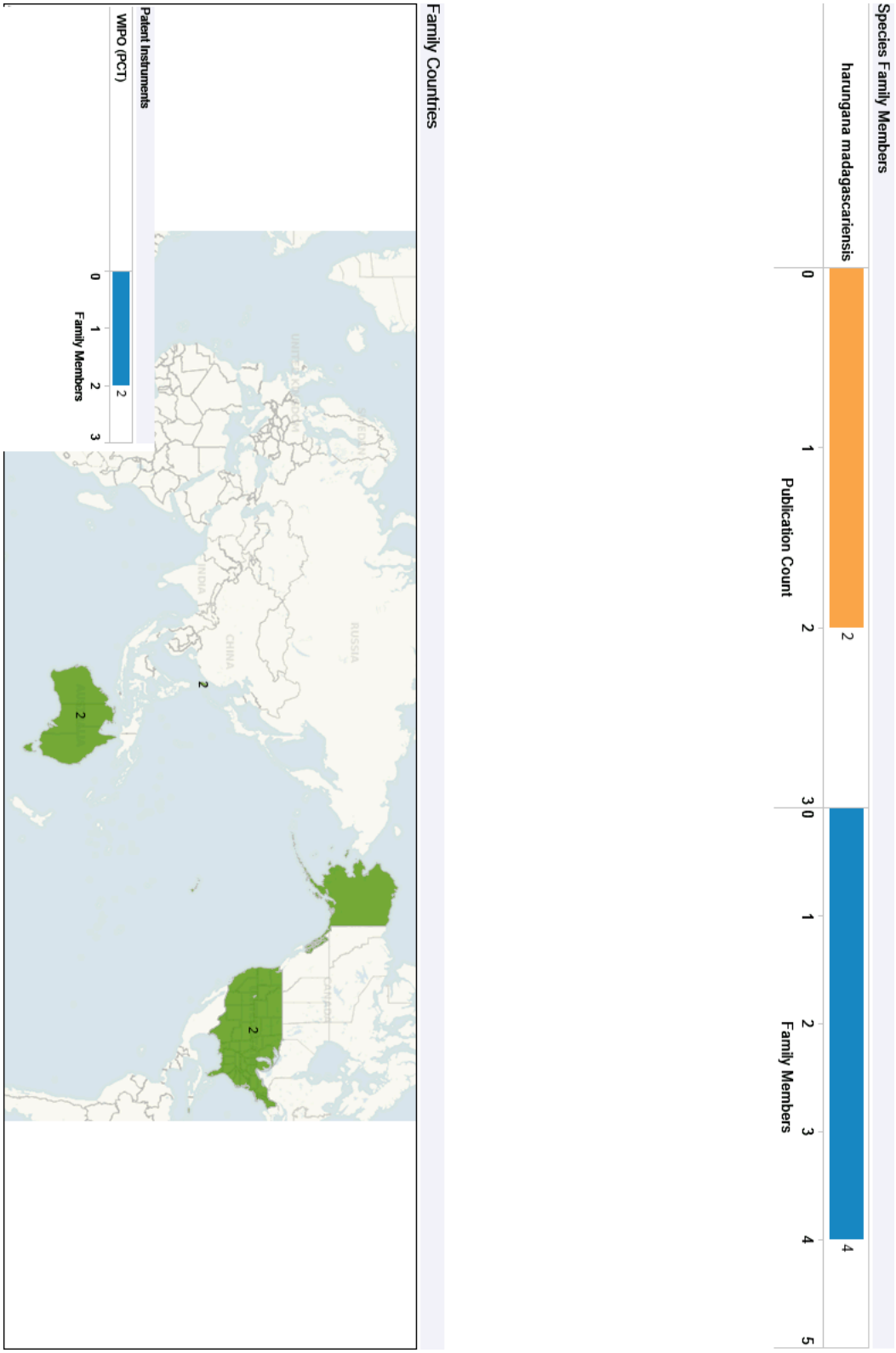
Plate 5 displays patent family data by species and a global map of countries where family members linked to the species have been recorded. Please note that the map does not display the geographical locations for regional and international patent offices. Plate 5 is useful because it reveals what might be called the global reach or careers of species.

Analysis of this type is also useful because it exposes the markets where protection is being sought as provided in the Family Countries map. In the case of Burundi the species Harungana madagascariensis is protected in the United States of America and Australia. It is also striking that available data suggests that patent applicants are not pursuing

[6] INPADOC stands for the International Patent Documentation Centre which established the system. INPADOC is now part of the European Patent Office.

protection in Burundi or other African countries. This suggests that opportunities may exist within internal markets in Africa where patent protection is unlikely to prove to be a barrier. At the same time, patent data also suggests countries where markets may exist for products involving biodiversity from Burundi.

*Plate 5: Global Distribution of Family Members*



**Concluding Remarks:**

The research into biodiversity and patent activity featuring species originating from Burundi has been notable by the lack of references to collection from the country. No documents were identified which referred to species where the available data suggests that the species is endemic to Burundi. Therefore the analysis was restricted to documents which contained reference to a species known to be distributed in Burundi and also referred to the country name. In the case of the one species identified as being of relevance to Burundi this relevance was due to references made to traditional knowledge.

Burundi is a small, land-locked country with limited infrastructure, that is likely to share much of it's biodiversity with neighbouring countries such as Tanzania. The relatively low number of species recorded in data held by GBIF suggests that insufficient records are available to build a complete picture of the true diversity that exists. The reasons for the lack of activity in the patent record can only be a matter of speculation. Political and social upheavals, and the relative ease of accessibility to other countries from which collections of species could be made may have contributed to the lack of focus on biodiversity in Burundi. This does not mean that biodiversity and traditional knowledge in Burundi is unimportant. Nor do these findings signify that biodiversity and traditional knowledge in Burundi are not relevant to research and development. Instead, it implies that, based on available evidence, there is very little reason to be concerned about biopiracy and that experience in other African countries could usefully inform policy development in Burundi in developing capacity in access and benefit-sharing.

The purpose of this report has been to highlight the existing and potential role of species of relevance to Burundi for economic development in support of conservation. We would emphasise that our aim has not been to identify cases of biopiracy or misappropriation. In addition the aim of the research was not to identify the complete portfolio of patent activity for a particular species or genetic resource. We have focused on those patent documents that make direct reference to Burundi or where distribution data suggests that Burundi is a likely source.

The next section presents a summary card for each species identified in the course of the research. An online interactive version of the card will be made available through abspat.net to facilitate further research.

## Species Summary Tables

The following summary table describes the species and patent activity involving the species. This data is based on known distribution of species and, in the case of Burundi, reference to traditional knowledge and use of that species:

In reading this table note that the number of documents refers to the number of documents retained during research on the origin of species of relevance to Burundi. It does not refer to the wider patent landscape for the species consisting of the total of number of documents making reference to the species, or its components, in the global patent system.

Species may appear in patent documents in this list for a variety of reasons:

1. Because they are a focus of the invention;
2. Because they are a target of the invention (i.e. pathogens);
3. Because they are incorporated into the claims of the invention;
4. Because a reference to a species, including in very limited cases a literature reference, indicates that the species is of potential interest for economic development and merits further investigation.

This report focuses on identifying species that are of potential interest for economic development and conservation based on their appearance in patent data. The data in this summary section should not be used to draw conclusions about misappropriation or biopiracy.

<table>
<tr><td>Species name:<br>Harungana madagascariensis</td><td>Kingdom: Plantae</td><td rowspan="2">  </td></tr>
<tr><td colspan="2">Brief description of species:<br>Harungana madagascariensis is a species of flowering plants in the family Hypericaceae and the sole member of the genus. It has many medicinal uses.</td></tr>
<tr><td colspan="2">Distribution: Cosmopolitan</td><td>No of documents: 2</td></tr>
<tr><td colspan="3">US5837255A; WO1998025639A1</td></tr>
<tr><td colspan="3">Detail: Hypoglycemic agent extracted from Harungana used in a treatment for diabetes. This plant has traditional medical uses in Burundi.</td></tr>
</table>

### Image Credits

Harungana madagascariensis - Bart Wursten 140420-1.jpg

# Appendix 1

Distribution map of GBIF records in Burundi coloured by taxonomic kingdom.