BioInnovation Monitoring Tool (BioMoT)

Analysing the use of South Africa's biological and genetic resources through artificial intelligence (AI)

Purpose of the Tool

Within the German-South African Cooperation on Biodiversity, an innovative Artificial Intelligence (AI)-powered IT Monitoring Tool has been developed and demonstrated to the DFFE, leveraging AI to analyse large online datasets for trends in research, patenting and products. It facilitates automated analysis and reporting, enabling efficient monitoring of local and international use of South African biological and genetic resources, including Digital Sequence Information (DSI). These insights inform policy development, promoting the Biodiversity Economy and ensuring compliance with the Nagoya Protocol. Commissioned by GIZ's "BioInnovation Africa" project, the tool benefits various stakeholders, including industry, government, and academia. Developed by One World Analytics, it will be regularly updated to adapt to rapid AI advancements and market trends.

This tool supports the National Biodiversity Economy Strategy and the Bioeconomy Strategy, that promote wealth creation, employment, and equitable benefit sharing. Reports from the tool serve to warn early of emerging market trends that could harm indigenous biological resources, so aiding in biodiversity conservation. The tool supports the monitoring of illegal international trade, supporting our Scientific Authority and enhancing efforts like the National Response Strategy to Combat the Illegal Trade in South African Succulent Flora. It can also be used by industry to track trends in patents and scientific research and therefore to identify new markets. The tool is being showcased during this Indaba.

Who can benefit from this Tool?

The Tool has wide application for many stakeholders in the biodiversity economy including:

- Policy makers and regulators who monitor trends in academic and commercial utilisation of South African biodiversity and Digital Sequence Information (DSI).
- Policy makers wishing to provide support to species or sectors with economic growth potential.
- Those tasked with identifying and tracking biopiracy events and the illegal trade in South African species of plants and animals.
- Private companies looking for potential customers, new commercial applications, and relevant research developments, and the patenting activities of competitors.
- Business support organisations looking to provide strategic sector development guidance to particular value chains within the biodiversity economy.
- Academic researchers and their funding agencies looking to track current trends in bioscience and biotechnology.

What does the Tool do?

The Tool collects data from three main online databases accessing worldwide patent information, published scientific papers, commercial listings revealing trends in areas of interest for specific user groups.

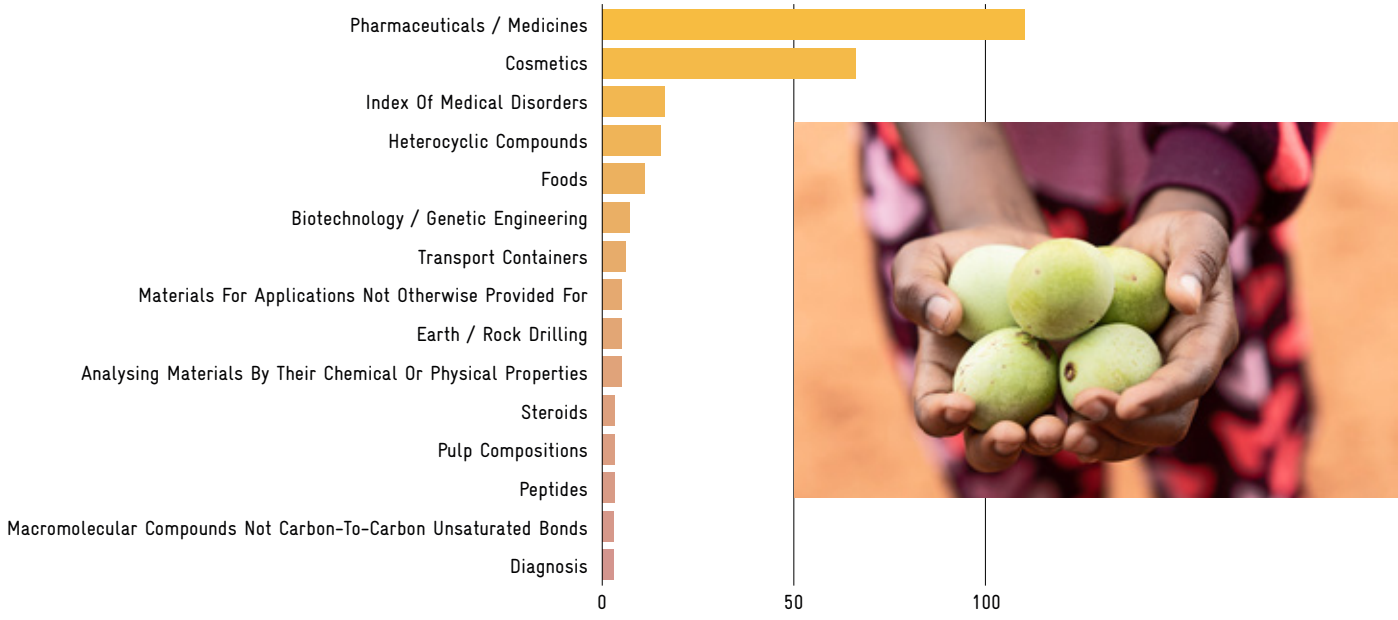
An automated report is designed to deliver enhanced insights into the patent, research and commercial landscape associated with whatever species is of interest to the user. Comprehensive overviews are produced by collecting and analysing data from the web, patent applications and scientific publications.

Patent data

The following data is presented in the automated report:

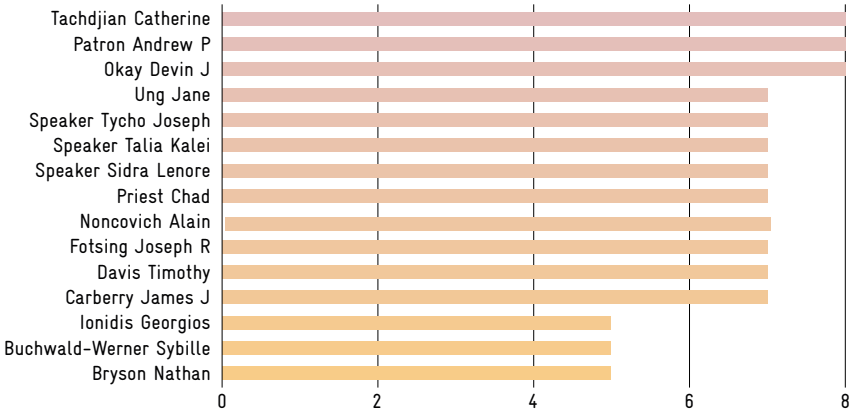
- Trends over time, for example increases or decreases in the number of patent applications in cases where the plant species is named in the patent.
- Commercial activity areas of the patent applications such as pharmaceuticals, cosmetics, foods, beverages etc.
- The names of inventors of the patent.
- A visualised display of the research and commercial network of inventors and applicants across the globe.
- Information on where the patents are filed such as South Africa, China, the USA and Europe.
- A full list of all patent applications associated with a particular species.
- Changes in applicants: who is patenting more on a species and who the emerging patent applicants are.

Areas of interest in patenting for *Sclerocarya birrea* (Marula)



This graph presents the key topics identified in patent applications that mention the species, providing insights into the principal areas of commercial focus related to this species, highlighting where research and development efforts are concentrated.

The inventors most frequently indentified in patent documents that reference *Sclerocarya birrea*



This graph displays the inventors most frequently identified in patent documents that reference *Sclerocarya birrea*. Named inventors are individuals identified in the patents as the creators of a product. Often, there is a connection between the inventors listed on a patent and earlier scientific studies. This suggests that if a scientist applying for research permission has been previously credited in a patent, there is a significant possiblitiy that their research has commercial objectives.

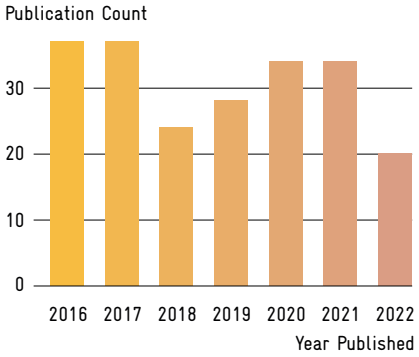
Academic research and scientific publications

The automated report presents an overview of trends in published scientific research relating to the species of interest. Novel applications or use cases for a species may first emerge in academic literature before they are reflected in patent data. By tracking these trends in scientific research, it is possible to identify potential new uses for the species. Furthermore, researchers may transition from academic study to patent application. Therefore, monitoring which researchers are focusing on this species, and whether they have previously filed for patents is of interest for compliance and regulatory purposes, offering insights into the future commercial exploitation of the species.

The following data are presented:

- Trends over time – showing the number of publications covering the species each year.
- Fields of study such as phytochemistry, ecology, pharmacology, medicine, food science etc.
- The named authors of the publication.
- The network of collaborating authors around the globe.
- The institutional affiliation of the authors.
- A comprehensive list of publication data.

Trends over time here showing Marula publications



This graph shows the annual count of research publications referencing this particular species. Trends in the volume of these publications may be indicative of shifts in academic interest in this species.

Monitoring trends in trade of South African species of conservation concern

BioMoT can be set up to monitor data from online marketplace sources such as the Amazon products API, for South African species such as succulents. The succulent genus *Conophytum* has been particularly negatively affected by illegal harvesting and international horticultural trade in recent years, with several species now extinct in the wild. Biodiversity management authorities can stipulate which species BioMoT monitors and commercial listing of products based on these species in the datasets will be presented in an automated report. Thousands of species (e.g. succulents, geophytes, CITES and TOPS taxa, etc) can be monitored for minimal additional effort, thereby providing the potential for developing a dashboard covering all species of concern to be easily visualised on a weekly, monthly or other basis. The monitoring of online trade, both legal and illegal, can inform appropriate interventions that might include law enforcement, policy development, and targeted business activity.

Commercial information from Amazon

A table summarising information on listings available from example www.amazon.com and passing them to an AI model for analysis is also presented for any species of interest.

This data can include the name of the product with a link to the product as it is found on www.amazon.com and the product size, price and sales sources. The data is then passed to an AI model for analysis with the aim of identifying any commercial uses for the species found in the listings.

Commercial Products *Conophytum*

Based on the provided data from the Amazon products API, there is no specific information available about the uses of the *Conophytum* plant species in products. The data only includes listings for seeds and plants of the *Conophytum* species, with no mention of any specific uses or purposes for these products. Therefore, no information is available regarding the cosmetic, nutritional, health, or any other uses of this species in products.

The table below contains the products we have found relating to this species on amazon.com.

Show 10 entries Search:

	Product	Price
1	Rare Conophytum Obcordellum SSP Ceresianum (LSL) Living Stones Mesemb Seed 15 Seeds	
2	Conophytum Supremum Rare Mesemb (LSL) Exotic Semi Rock Living Stones Seeds 15 Seeds	
3	Conophytum Ernianum Rare Mesemb (LSL) Exotic Semi Rock Living Stones Seeds 15 Seeds	$20.00
4	Conophytum Obcordellum SSP Ceresianum (LSL) Living Stones Mesemb Cacti Seed 15 Seeds	$20.00
5	Conophytum Limpidum Rare Mesemb (LSL) Exotic Semi Rock Living Stones Seeds 15 Seeds	$20.00
6	Conophytum Ectypum (LSL) Exotic Cactus Rare Living Stones Mesemb Cacti Seed 15 Seeds	$20.00
7	Conophytum Subglobosum Rare Mesemb (LSL) Exotic Semi Rock Living Stones Seeds 15 Seeds	$20.00
8	Conophytum Meyerae Rare Mesemb (LSL) Exotic Stone Rock Living Stones Seeds 15 Seeds	
9	Conophytum Flavum SSP Novicium (LSL) Exotic Living Stones Mesemb Cacti Seed 15 Seeds	
10	Conophytum Quaesitum (LSL) Exotic Cactus Rare Living Stones Mesemb Cacti Seed 15 Seeds	$20.00

Showing 1 to 10 of 48 entries Previous 1 2 3 4 5 Next

Commerical products Marula

The data and summary from the table were generated by taking search results from amazon.com and passing them to an AI model for analysis.

The provided data is a return from our products API relating to a plant species called Marula (scientific species name: *Sclerocarya birrea*). Marula is used in various products, including skincare and haircare. In skincare, Marula is used in body oils for stretch marks and firming purposes. It is also used in a shimmering gold oil for a radiant skin appearance. In haircare, Marula is used in shampoos, conditioners, and hair treatments for its hydrating and strengthening properties. Additionally, Marula oil is available in its pure form for use as a moisturizer for the face, skin, and hair. Other uses of Marula oil include its incorporation into organic and natural products, such as soaps and essential oil carriers. Overall, Marula is utilized for its cosmetic and health benefits in various products.

The table below contains the products we have found relating to this species on amazon.com.

Show 10 entries Search:

	Product	Price
1	African Botanics Neroli Infused Marula Oil	
2	Cedar Mountain Acai & Mangosteen Scented Shampoo and Hair Conditioner Set with Marula Oil, 1 Gallon Shampoo 1 Gallon Conditioner	$199.94
3	GPC Silk Protein Intense Aldehyde Hair Treatment -Black Caviar Organic Coconut Oil Organic Argan,Organic Hemp Seeds,Organic Marula, Peppermint Oils MAKERS OF KERATIN CURE (15 oz)	$194.00
4	Deve Herbes Pure Organic Marula Oil (Sclerocarya birrea) Cold Pressed 1250ml (42 oz)	$169.99
5	African Botanics Marula Firming Botanical Body Oil	
6	African Botanics Marula Stretch Mark Botanical Body Oil	
7	MARULA OIL Cold Pressed Unrefined	100% Natural Available in Bulk	Carrier for Essential Oils, Face, Skin, Hair Moisturizer, Soap Making	Sizes 2OZ to 7 LBS	(7LBS)	$104.94
8	Original Hair Oil	Hydrating Oil Serum to Smooth Frizz and Add Shine	Nourishes With Argan Oil, Camellia Oil & Marula Oil	For All Hair Types	$85.87
9	Original Hair Oil	Hydrating Oil Serum to Smooth Frizz and Add Shine	Nourishes with Argan Oil, Camellia Oil & Marula Oil	For All Hair Types 50ML	$85.87
10	Marula Oil - 100% Pure, Cold Pressed (3.40 fl oz, ZIN: 428367) - 3 Pack		$85.30

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