

GROW Webinar

26<sup>th</sup> Oct 2023, 15:00 – 16:00 CEST

Royal Botanic Gardens

**Kew**



**Unlocking plant resources for a sustainable future:  
from conservation to use**

Tiziana Ulian\*, Maraeva Gianella and Udayangani Liu

\*Senior Research Leader - Sustainable Use, Seeds & Solutions, Royal Botanic Gardens, Kew (U.K.)

Visiting Professor, Department of Life Sciences and Systems Biology, University of Turin (Italy)

([t.ulian@kew.org](mailto:t.ulian@kew.org))



320 acres (c. 130 hectares) with vast collection of 14,000 trees from the temperate world

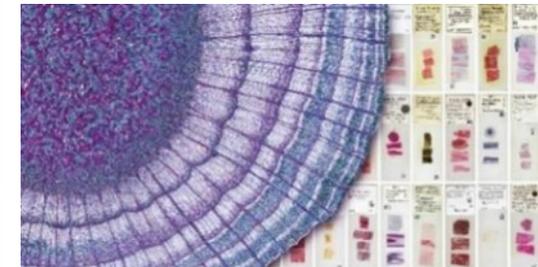
# COLLECTIONS and INFRASTRUCTRE



8.5m Herbarium & Fungarium specimens



50,000 DNA samples



150,000 microscope slides



2.2 billion seeds from 40,000 species



6,000 *in vitro* specimens



17,000 species  
in cultivation  
at Kew

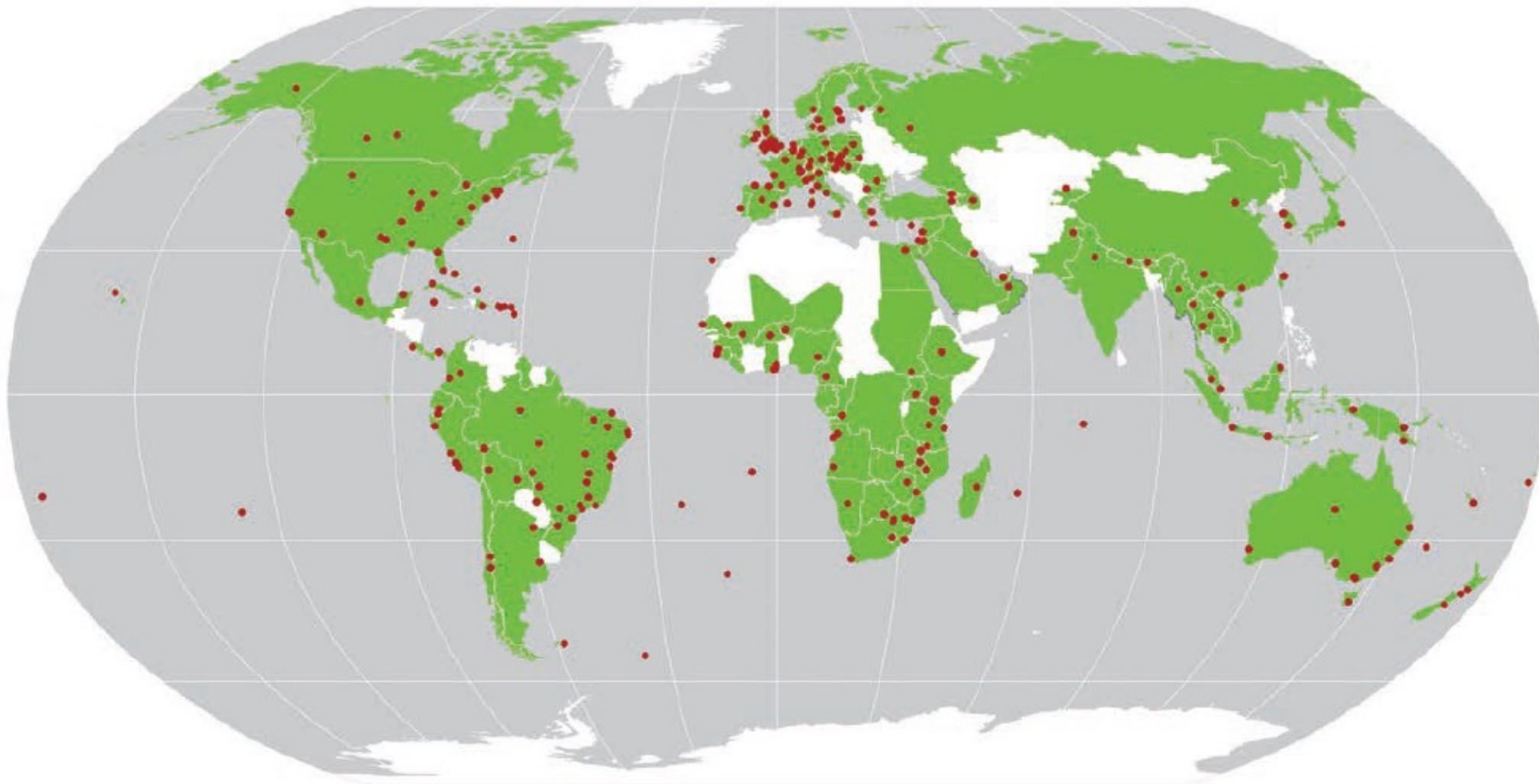


300,000  
books



> 100,000  
Economic  
Botany  
artefacts

**Partnership > 100 countries (ca. 400 collaborators)**





Wild botanic garden in the heart of Sussex, home to the Millennium Seed Bank, over 500 acres of diverse landscapes and plants from across the globe.

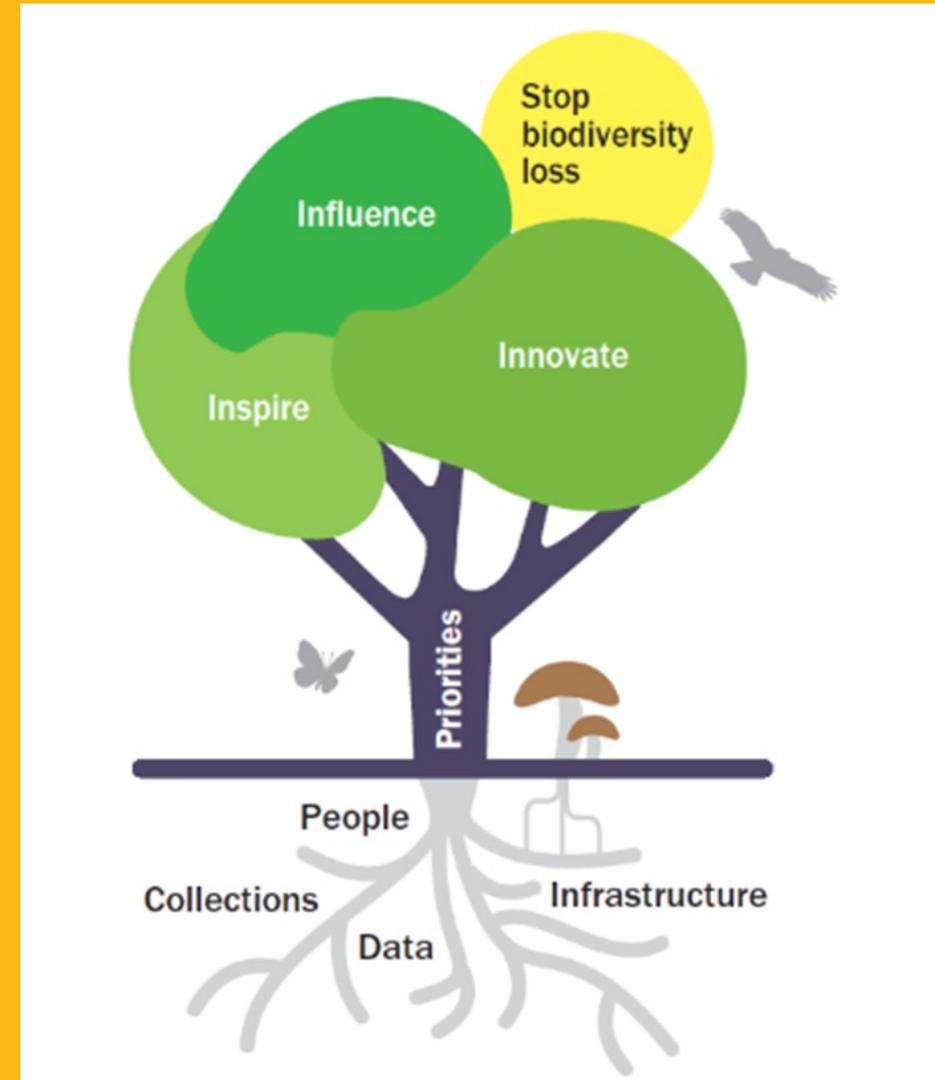


## 1. Targeting & documenting Useful Plants – food plants (globally)

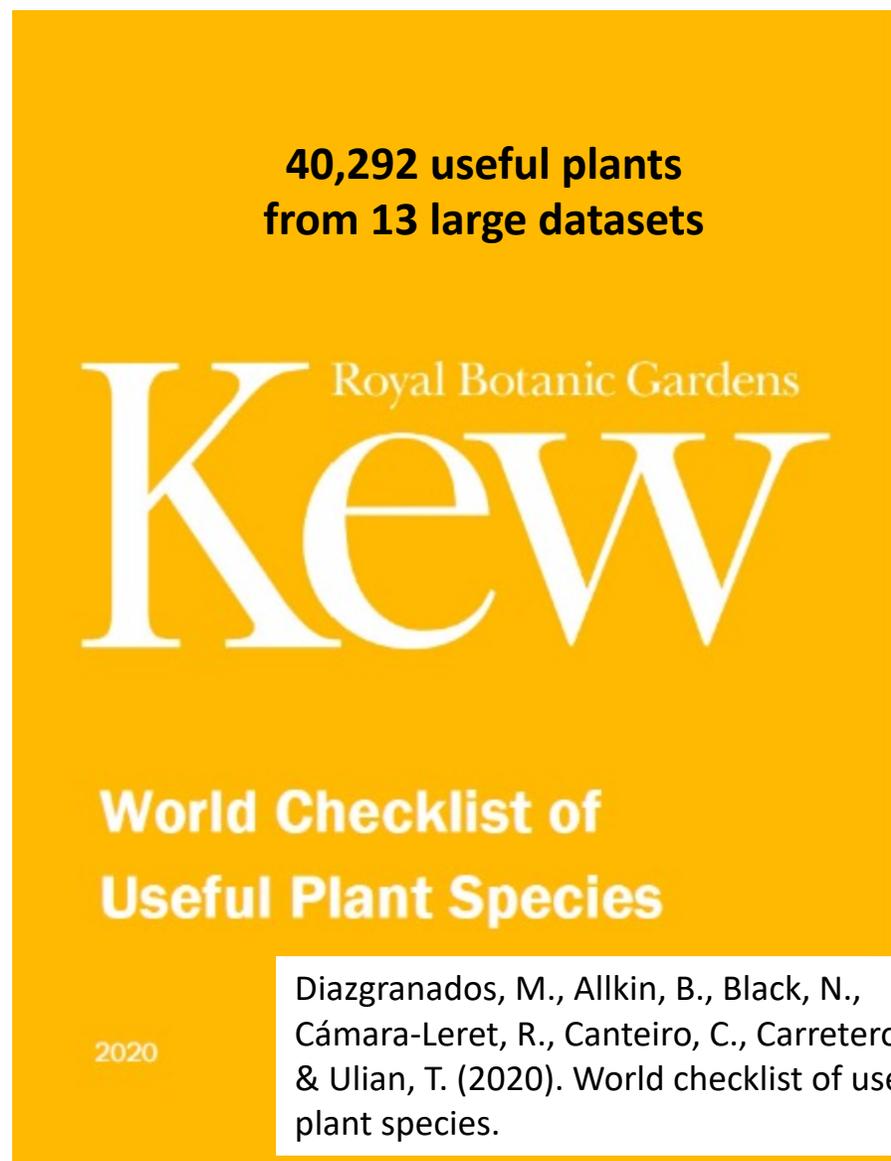
- Millennium Seed Bank
- Useful Plants and Fungi of Colombia Project

## 2. From seed conservation to use

- Restoring the traditional Mediterranean diet
- Kew's programme in Mexico



# Targeting and Documenting Useful Plants



REVIEW ARTICLE | [Open Access](#) |

## Unlocking plant resources to support food security and promote sustainable agriculture

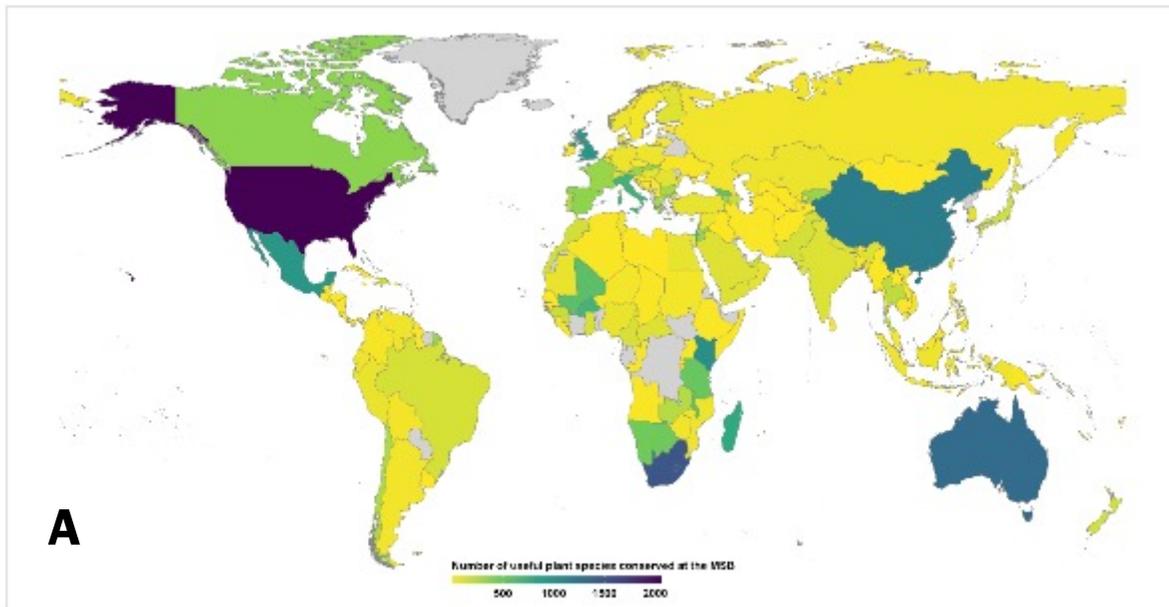
Tiziana Ulian , Mauricio Diazgranados, Samuel Pironon, Stefano Padulosi, Udayangani Liu, Lee Davies, Melanie-Jayne R. Howes, James S. Borrell, Ian Ondo, Oscar A. Pérez-Escobar, Suzanne Sharrock, Philippa Ryan, Danny Hunter, Mark A. Lee, Charles Barstow, Łukasz Łuczaj, Andrea Pieroni, Rodrigo Cámara-Leret, Arshiya Noorani, Chikelu Mba, Rémi Nono Womdim, Hafiz Muminjanov, Alexandre Antonelli, Hugh W. Pritchard, Efisio Mattana ... [See fewer authors](#) ^

[Open Access](#) [Review](#)

## Born to Eat Wild: An Integrated Conservation Approach to Secure Wild Food Plants for Food Security and Nutrition

by Teresa Borelli <sup>1,\*</sup> , Danny Hunter <sup>1</sup> , Bronwen Powell <sup>2</sup> , Tiziana Ulian <sup>3</sup> , Efisio Mattana <sup>3</sup> , Céline Termote <sup>1</sup> , Lukas Pawera <sup>4,5</sup> , Daniela Beltrame <sup>6</sup> , Daniela Penafiel <sup>7,8</sup> , Ayfer Tan <sup>9</sup> , Mary Taylor <sup>10</sup> and Johannes Engels <sup>1</sup>

# Useful Plants species conserved at the Millennium Seed Bank (MSB) – captured UPs



Representation of UPs in the MSB collection by biogeographic continent **B**

TDWG level 1 code	TDWG description	Total number				
		Countries*	Accessions	Families	Genera	Species
1	Europe	39	11,901	124	761	2071
2	Africa	49	14,565	214	1666	4891
3	Asia-Temperate	30	11,397	176	1212	3139
4	Asia-Tropical	19	1687	118	434	689
5	Australasia	3	2477	135	600	1432
6	Pacific	7	58	26	38	44
7	Northern America	3	5333	178	1103	2911
8	Southern America	32	2167	138	546	893
9	Antarctic	3	115	21	38	45
	Unknown	n/a	1330	112	395	689
Total	9	175	51,030	325	3696	13,598

\*Some countries span over two continents

A) Spatial distribution of the Useful Plants (UPs) species conserved at the MSB and B) Number of countries, accessions, families, genera and species by biogeographic continent

- 13,598 Useful Plant (UP) species (34%) belonging to 3,696 genera and 325 families
- Approximately, one in two accessions conserved and one in three species captured are UPs.

**BLOG** linked to article: [The Millennium Seed Bank as the Noah’s Ark of global wild useful plants. | Kew](#)

Biodiversity and Conservation (2023) 32:2791–2839  
<https://doi.org/10.1007/s10531-023-02631-w>

ORIGINAL RESEARCH

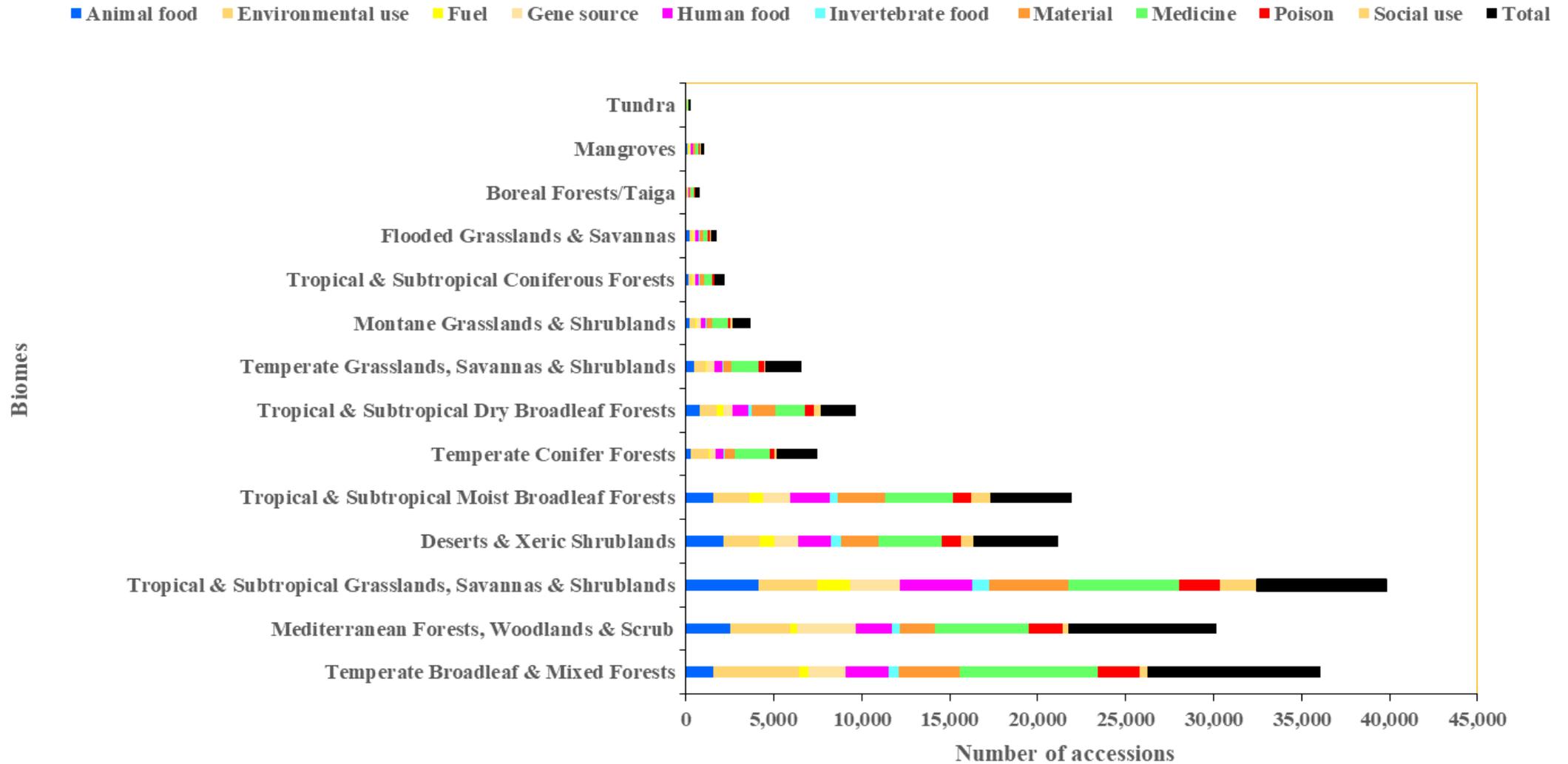


Conserving useful plants for a sustainable future: species coverage, spatial distribution, and conservation status within the Millennium Seed Bank collection

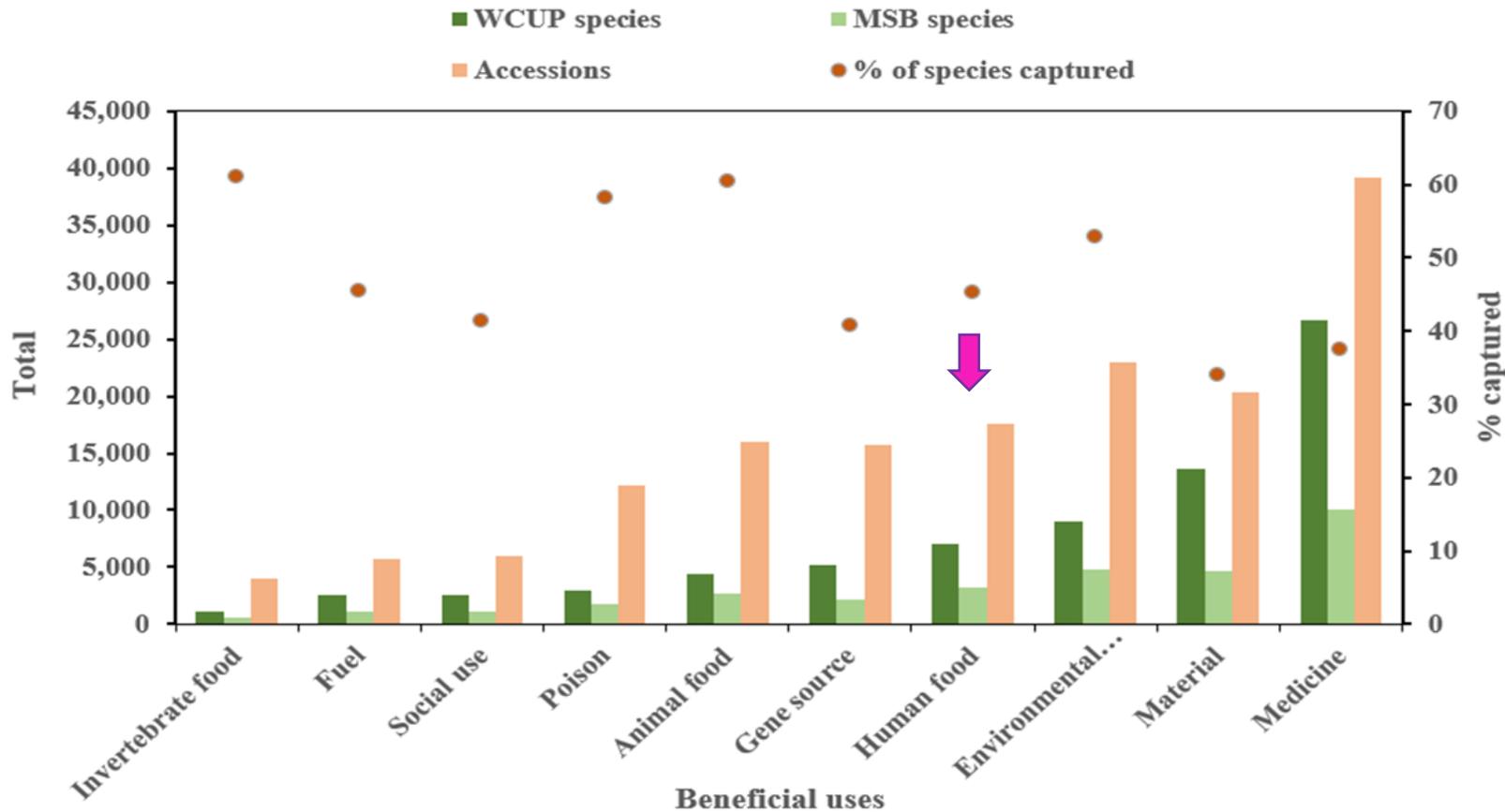
Udayangani Liu · Maraeva Gianella · Patricia Dávila Aranda · Mauricio Diazgranados · César Mateo Flores Ortiz · Rafael Lira-Saade, et al. [full author details at the end of the article]

Link to article: <https://rdcu.be/dphsT>

# Useful Plants species conserved at the Millennium Seed Bank (MSB) – captured UPs



# Useful Plants species conserved at the Millennium Seed Bank (MSB) – captured UPs

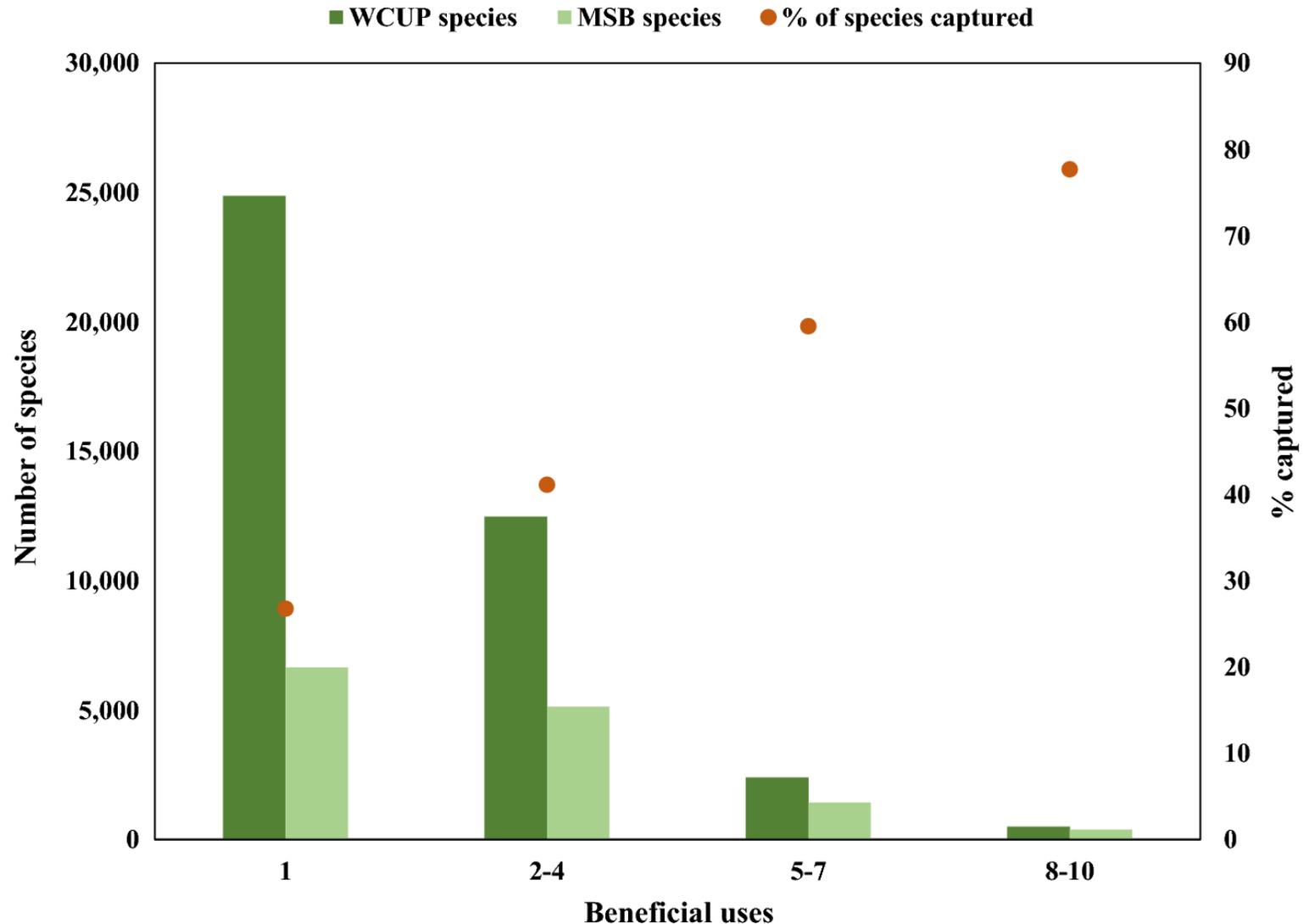


Representation of UPs by beneficial use: MSB (51,030 accessions from 13,598 species) against WCUP (40,239 species).

- 3,182 food plant species (> 40 %) and 2,677 animal food species
- 79 of the 94 crop genera (84%) have been captured by 10,089 UP accessions from 116 countries.
- The most common *beneficial use* category is medicinal, followed by environmental, material, and human food value.
- Accessions followed a similar order, but the % species captured was relatively higher for invertebrate food, animal food, poison, and environment use (53–61%) than for fuel, human food, social use, gene source, medicine, and material (34–46%).

# Useful Plants species conserved at the Millennium Seed Bank (MSB) – uncaptured UPs

- Seeds traits (e.g., seed storage behaviour) or “Exceptional Plants” which preclude storage in conventional seed banks were assessed using Dickie and Pritchard (2002), Seed Information Database (SID-RBG Kew 2022) and Pence et al. (2022): at least **112 uncaptured genera likely bear recalcitrant seeds**. This accounted for 1399 UP species listed in WCUP.
- Of the missing 15 CWR genera, 7 are known to be recalcitrant, 3 intermediate, 3 possibly orthodox, 2 orthodox. From the 8 missing multipurpose UP species, 6 are likely to have recalcitrant seeds. At least 288 UP species fit the category of being “Exceptional Plants”.



# Useful Plants and Fungi of Colombia

Understanding Colombia's useful plants and fungi to improve people's livelihoods, reducing inequality and gender gap by boosting its bioeconomy through the sustainable use of its biodiversity.

Mauricio Diazgranados, Tiziana Ulian<sup>1</sup>, Carolina Castellanos-Castro<sup>2</sup> and Felipe Garcia-Cardona<sup>2</sup>

<sup>1</sup> Royal Botanic Gardens, Kew

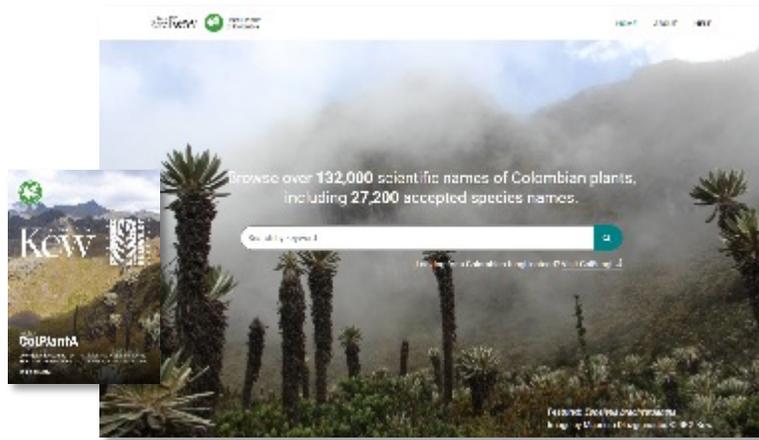
<sup>2</sup> Instituto de Investigación de Recursos Biológicos Alexander von Humboldt

# Useful Plants and Fungi of Colombia (UPFC)

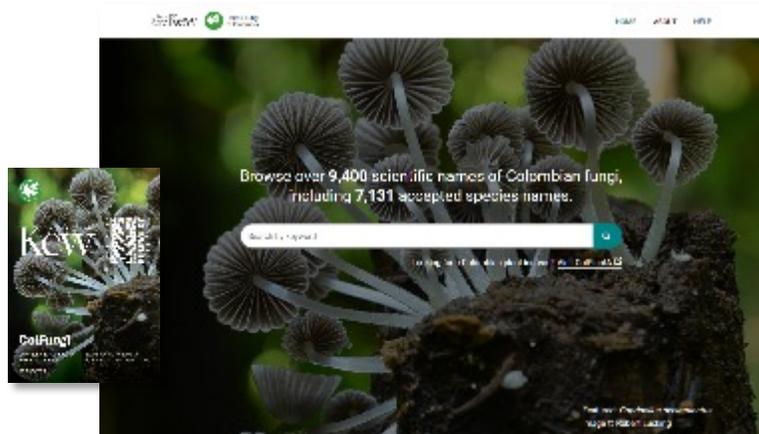
*To provide pathways to develop the country's bioeconomy.*

Online platforms making accessible the knowledge

Red de Ingredientes Naturales (REDin) - Colombia



**119 researchers**  
**26 external institutions**  
**140 outputs**



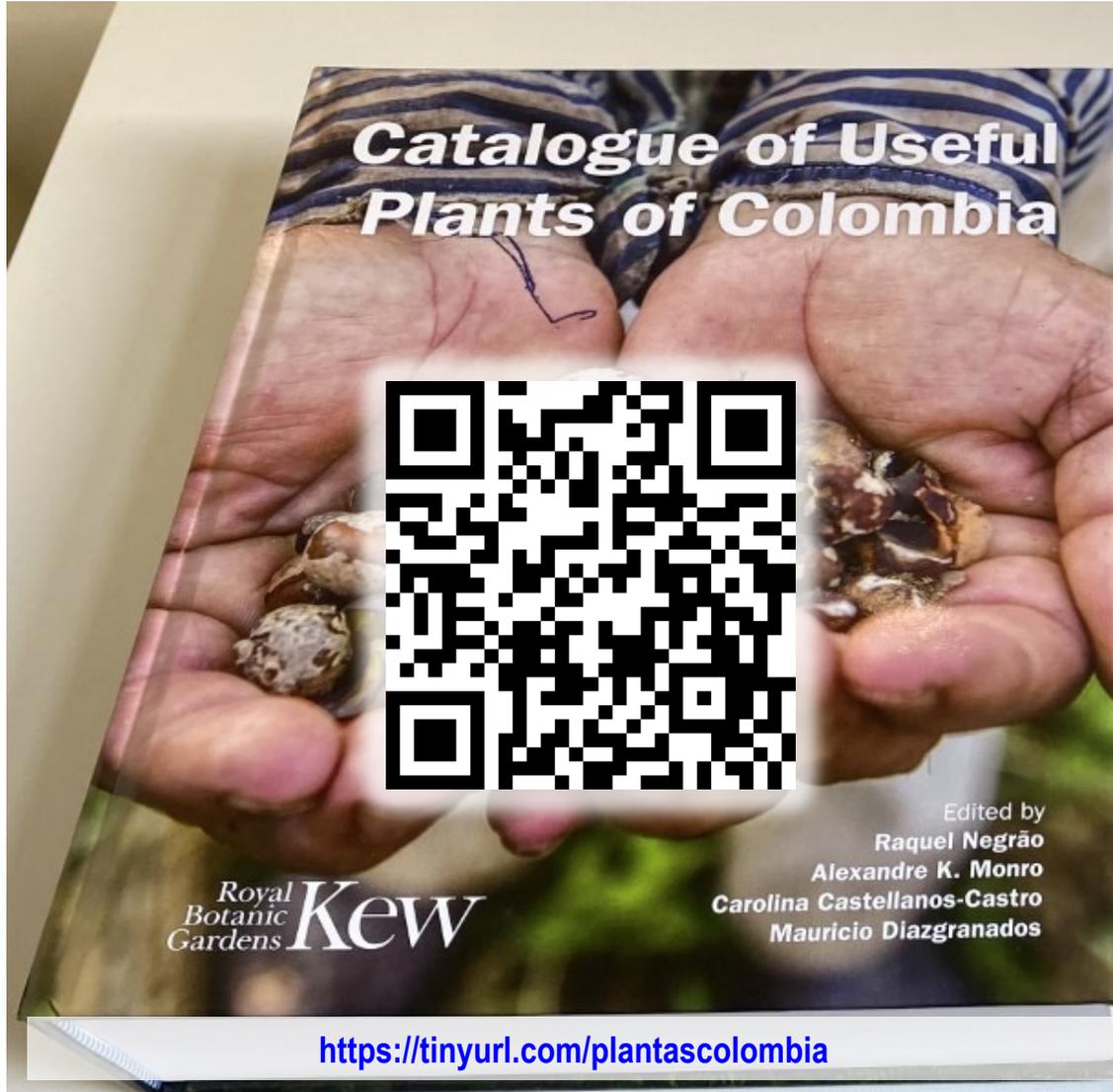
<https://redin-colombia.org/>

Development of Platform for a Value Chain Network that will allow connecting all the actors along the value chain

– First of its kind –

[In-Colombia.org – proyecto Plantas y Hongos Útiles de Colombia](https://in-colombia.org-proyecto-plantas-y-hongos-utiles-de-colombia)

# Catalogue of Useful Plants of Colombia & Catalogue of Fungi of Colombia



# Understanding the diversity of Colombian Wild Edible Plants (WEP)

## Background

Food Insecurity in rural households was 57.7% in 2010 and 54.2% in 2015.

Native plants consumption in Colombia has significantly decreased over time.

Today, only 198 WEP are part of the market of natural products in Colombia

90% of the natural ingredients marketed in Colombia are imported

## Research questions

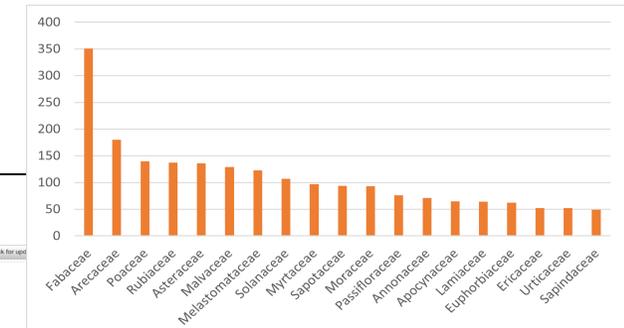
What is the taxonomic diversity of WEP in Colombia?

What is their conservation status and biogeographic distribution across bioregions?



## Findings

- 3.805 species are edible in Colombia
- The departments of **Antioquia** and **Cundinamarca** are the richest in edible species

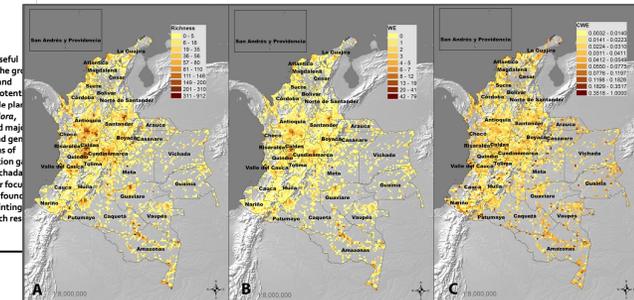


### scientific reports

#### OPEN Understanding the diversity and biogeography of Colombian edible plants

B. Gori<sup>1</sup>, T. Ulian<sup>1</sup>, H. Y. Bernal<sup>2</sup> & M. Diazgranados<sup>1,2</sup>

Despite being the second most biodiverse country in the world, hosting more than 7000 useful species, Colombia is characterized by widespread poverty and food insecurity. Following the attention in Neglected and Underutilized Species, the present study will combine spatial and taxonomic analysis to unveil their diversity and distribution, as well as to advocate their potential key resources for tackling food security in the country. The cataloging of Colombian edible plants resulted in 3805 species. Among these, the most species-rich genera included *Inga*, *Passiflora*, *Miconia*, *Solanum*, *Pouteria*, *Protium*, *Annona* and *Baccharis*. Biogeographic analysis revealed major diversity hotspots in the Andean humid forests by number of records, species, families, and genera. The departments of Antioquia, Boyacá, Meta, and Cundinamarca ranked first both in terms of number of unique georeferenced records and species of edible plants. Significant information about species distribution were detected in the departments of Cesar, Sucre, Atlántico, Vichada, Guainía, corresponding to the Caribe and Llanos bioregions, indicating the urgent need for focus investigation in these areas. Furthermore, a significant level of geographic specificity was found in edible plant species' distributions between 13 different bioregions and 33 departments, hinting adoption of tailored prioritisation protocols for the conservation and revitalization of such resources at the local level.



# Taxonomic diversity of CEP: *Passiflora*



# Towards sustainable value chains: the Guáimaro

Breadnut or ramon

*Brosimum alicastrum* Sw.

(Moraceae)

- Great environmental importance & nutritional qualities (high carbohydrates and antioxidant activity)
- Culinary versatility: the seed used to be a **staple food** for prehispanic. It can be eaten raw, boiled, roasted or made into **flour**, which can be used to improve the nutritional properties of traditional dishes.

Revitalisation through sustainable consumption and commercialisation in the community of Becerril - **effective tool for ecological conservation and forest restoration**

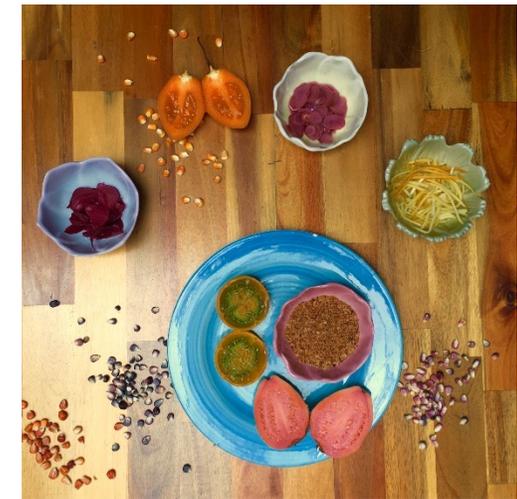


Guáimaro cultivation and processing in the community of Becerril. Dessert made with Guáimaro flour at Celele restaurant in Cartagena

# Conservation-through-use

## Collaboration between communities and restaurants

- Chefs and restaurants can represent key allies for achieving the conservation and revitalisation of these resources
- They can bridge the gap between farmers and public plates.
- They are directly and indirectly affecting agriculture, plant diversity and diets.
- Through them, communities can transform endangered products into economic assets.



Natural ingredients used by Restaurant Minimal in Bogotá and Celele Restaurant in Cartagena.

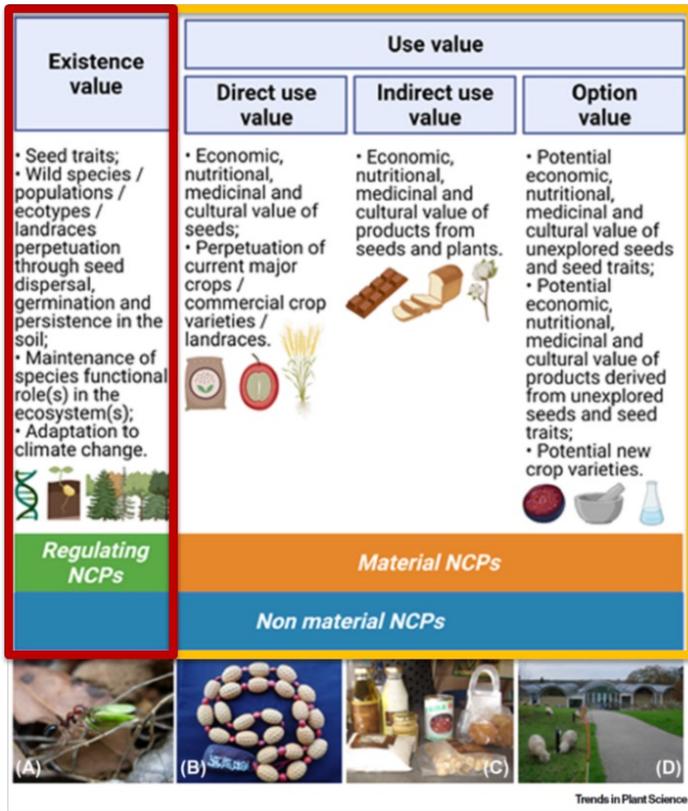


<https://bit.ly/UPFCVideoENG>  
<https://bit.ly/UPFCVideoESP>



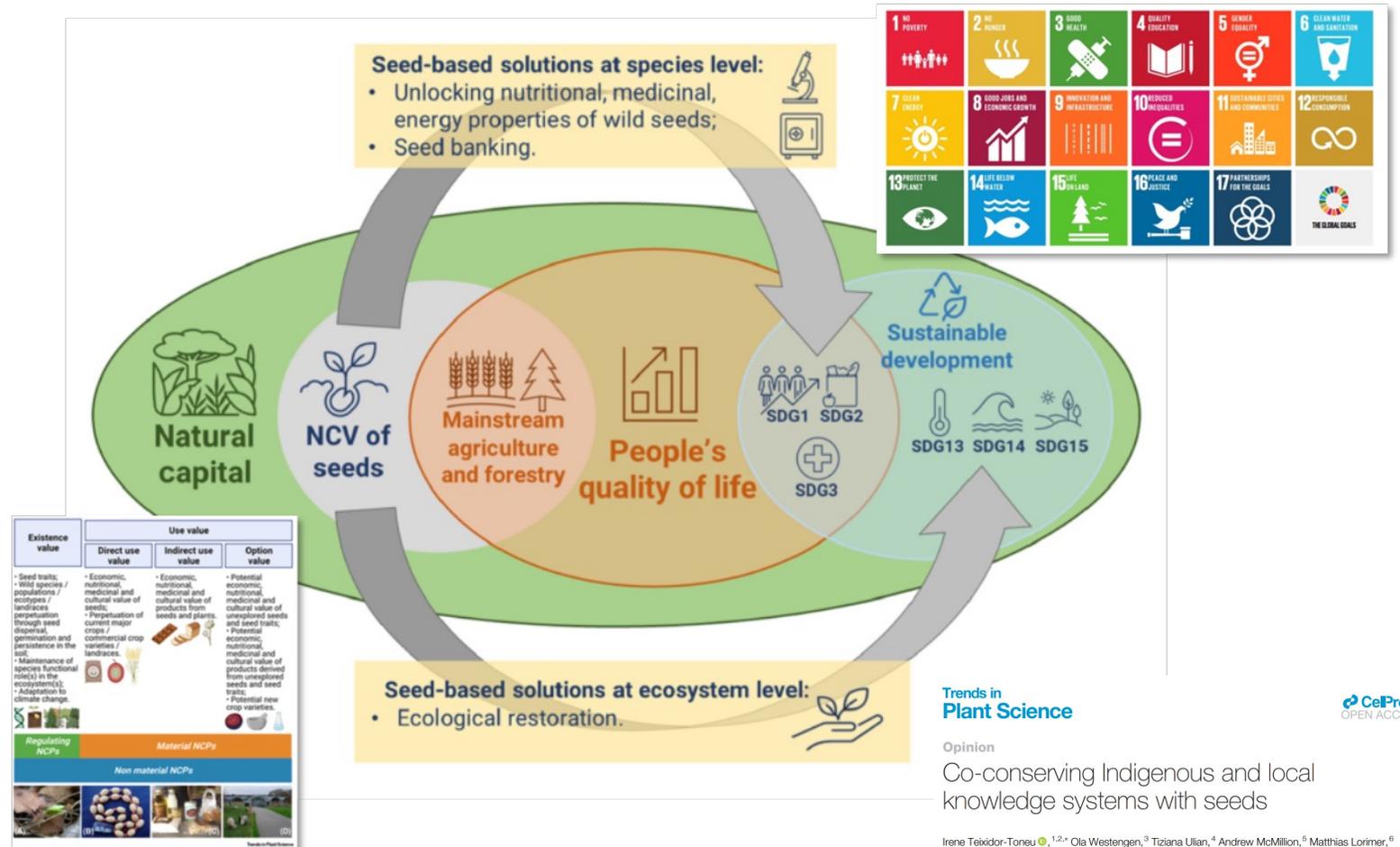


## Seeds as Natural Capital



Mattana, E., Ulian, T., & Pritchard, H. W. (2022). Seeds as natural capital. *Trends in Plant Science*, 27(2), 139-146.

## Seed-based Solutions to Global Challenges



Trends in Plant Science

Opinion  
Co-conserving Indigenous and local knowledge systems with seeds

Irene Teixidor-Toneu<sup>1,2,\*</sup>, Ola Westengen,<sup>3</sup> Tiziana Ulian,<sup>4</sup> Andrew McMillan,<sup>5</sup> Matthias Lorimer,<sup>6</sup> Owen Grace,<sup>7,8</sup> Sophie Caillon,<sup>9</sup> Pitambar Shrestha,<sup>10</sup> and Annelien Kooij<sup>2,\*</sup>

# From Seed Conservation to Use at the Millenium Seed Bank

## The MGU – Useful Plants Project



Botswana, Kenya, Mali, South Africa and Mexico

To enhance the capacity of local communities in Latin America and Africa to conserve and use sustainably indigenous plants



- Improve livelihoods
- Improve food security
- Improve human health
- Contribute to climate change mitigation

Ulian, T., Sacandé, M., Hudson, A., & Mattana, E. (2017). Conservation of indigenous plants to support community livelihoods: the MGU–Useful Plants Project. *Journal of Environmental Planning and Management*, 60(4), 668-683.

<https://www.tandfonline.com/doi/full/10.1080/09640568.2016.1166101>



## 'Great Green Wall' Cross Border Pilot Project



Burkina Faso, Mali and Niger

To contribute fighting desert progress in the Sahel by **restoring ecosystems, valorising and managing** sustainably natural resources



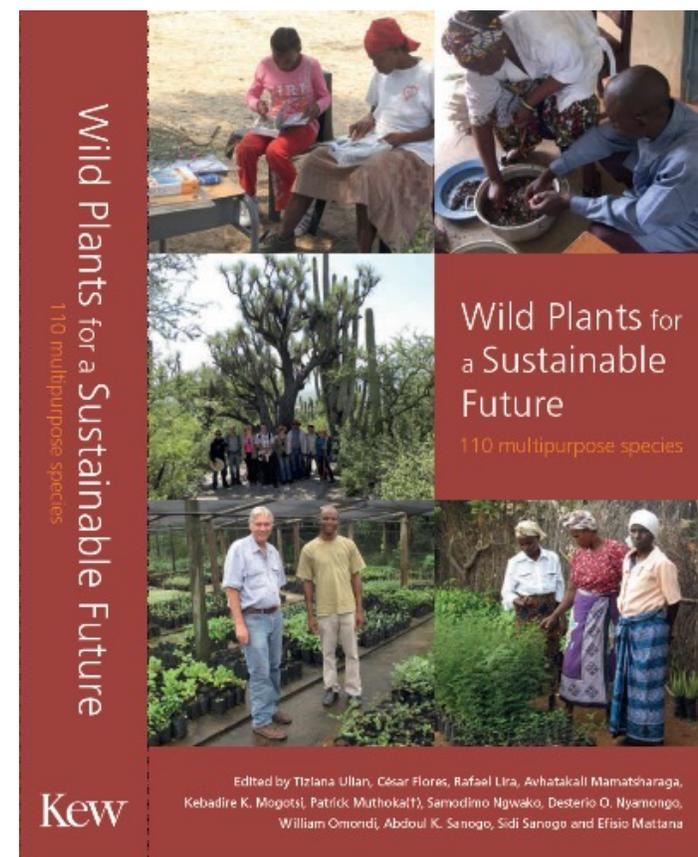
- Improve habitats
- Improve food security
- Improve livelihoods
- Contribute to climate change mitigation

Sacande, M., & Berrahmouni, N. (2016). Community participation and ecological criteria for selecting species and restoring natural capital with native species in the Sahel. *Restoration Ecology*, 24(4), 479-488.

<https://onlinelibrary.wiley.com/doi/full/10.1111/rec.12337>

# From Seed Conservation to Use at the Millenium Seed Bank

- Targeting and prioritizing useful plants
- Seed collecting
  - Seed banking (ex situ)
  - Plant propagation and conservation in local communities (in situ)
- Sustainable use and income generation
  - Plants (seeds, seedlings)
  - Plant Products



Available at <https://kew.iro.bl.uk/work/sc/e5f06281-47b4-4ab1-9b5e-7220abc066a8>

# Restoring the traditional Mediterranean diet (Res Med) Jordan and Lebanon

*To restore the Mediterranean diet through the conservation of Wild Edible Plants*

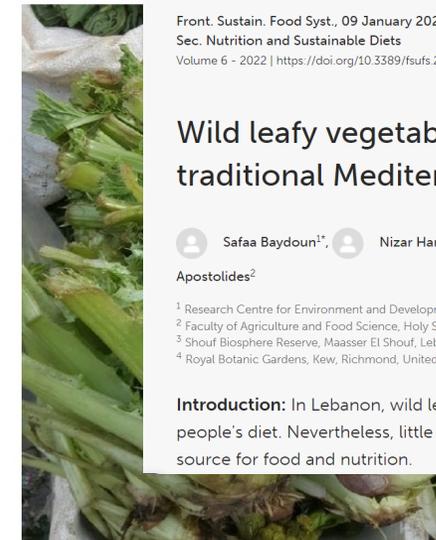


- Conservation of wild edible plants and the associated Traditional Knowledge.
- Research
  - Impact of climate change on their reproduction from seeds - seed germination.
  - Identification of key nutritional and other bioactive molecules.
- Promotion of the traditional cuisine, i.e., traditional dishes in selected restaurants and food festivals.
- Supporting the restoration of the Mediterranean **agricultural landscapes** - traditional terraces and orchards



Source: <https://www.kew.org/science/our-science/projects/restoring-Mediterranean-diet>

# Priority WEPs species



ORIGINAL RESEARCH article

Front. Sustain. Food Syst., 09 January 2023  
Sec. Nutrition and Sustainable Diets  
Volume 6 - 2022 | <https://doi.org/10.3389/fsufs.2022.991979>

This article is part of the Research Topic  
Edible Wild Plants and Fungi – Resources to Explore, Preserve, and  
Value

[View all 6 Articles >](#)

## Wild leafy vegetables: A potential source for a traditional Mediterranean food from Lebanon

Safaa Baydoun<sup>1\*</sup>, Nizar Hani<sup>2,3</sup>, Hatem Nasser<sup>2</sup>, Tiziana Ulian<sup>4</sup> and Nelly Arnold-Apostolides<sup>2</sup>

<sup>1</sup> Research Centre for Environment and Development, Beirut Arab University, Beirut, Lebanon  
<sup>2</sup> Faculty of Agriculture and Food Science, Holy Spirit University of Kaslik, Jounieh, Lebanon  
<sup>3</sup> Shouf Biosphere Reserve, Maasser El Shouf, Lebanon  
<sup>4</sup> Royal Botanic Gardens, Kew, Richmond, United Kingdom

**Introduction:** In Lebanon, wild leafy vegetables (WLVs) continue to be an essential component of people's diet. Nevertheless, little ethnobotanical research has addressed this important potential source for food and nutrition.

# Priority WEPs species



Akkoub (*Gundelia tournefortii* L.)

# Seed Conservation and Research

- **Seed Collecting & Conservation**
- **Seed germination studies** to understand the seed biology and ecology for long term storage and future cultivation efforts
- **Phytochemistry experiments** to understand the nutritional value of the species
- **Genetic diversity studies** to aid understanding of distribution and provide molecular tools for breeding



# Experimental work - Seed Germination

Seed germination studies to understand the seed biology and ecology for long term storage and future cultivation efforts

Tests on seed dormancy breaking and germination requirements



Original paper | [Open Access](#) | Published: 22 May 2021

Physiological and environmental control of seed germination timing in Mediterranean mountain populations of *Gundelia tournefortii*

[Efisio Mattana](#) , [Pablo Gómez-Barreiro](#), [Nizar Youssef Hani](#), [Khaled Abulaila](#) & [Tiziana Ulian](#)

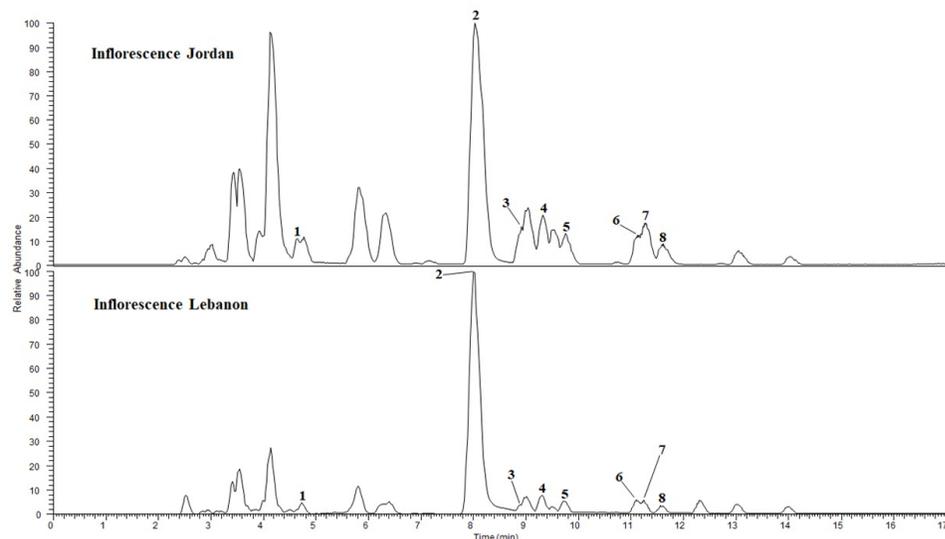
[Plant Growth Regulation](#) (2021) | [Cite this article](#)

699 Accesses | 4 Altmetric | [Metrics](#)



# Experimental work – Nutritional value

- Phytochemical analyses have been carried out on *Gundelia tournefortii* L.
- Amino acid content, protein content and high value chemistry have been analysed
- Tissue samples have included leaves and inflorescences



# Supporting the marketing

Some commercial plant products from WEPs at the Al-Shouf Cedar Nature Reserve, Lebanon

**Akkoub** (*Gundelia tournefortii* L.) pickled inflorescences





## **Kew's programme in Mexico**

**Native tree seeds to enhance the natural capital of Mexican forests**

*To protect, conserve and enhance the natural capital of the Mexican forests,  
built around a detailed understanding of native tree seeds*

Royal Botanic Gardens, Kew (UK). PI: Dr Tiziana Ulian, co-PI: Michael Way, coordinator: Dr Maraeva Gianella  
Facultad de Estudios Superiores Iztacala, UNAM (Mexico). Dr Patricia Davila, Dr Isela Rodriguez, Dr Cesar Flores.  
Pronatura Veracruz A.C., Mexico. Elisa Peresbarbosa Rojas.  
Institute of Ecology A.C., Mexico. Dr Maria Toledo, Dr Robert Manson.

# Millennium Seed Bank Project (now Partnership)

## Mexico

- Access and Benefit Sharing Agreement between UNAM and Kew (2002)
- > 4,000 seed accessions (2,037 spp.) banked with a focus on endemic, endangered, and **useful plant species**





Universidad Nacional  
Autónoma de México



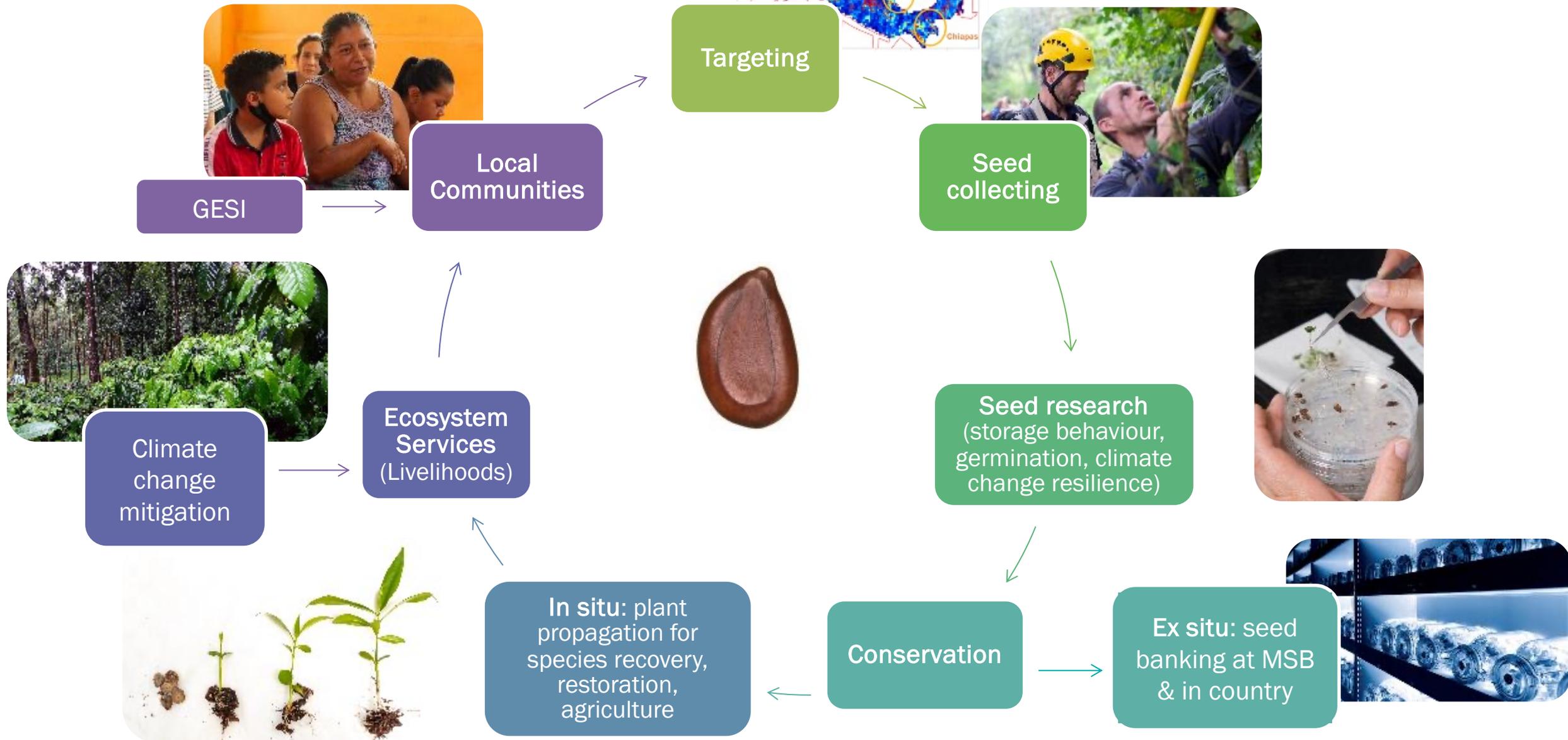
## **Native tree seeds to enhance the natural capital of Mexican forests**

*To protect, conserve and enhance the natural capital of the Mexican forests,  
built around a detailed understanding of native tree seeds*

1. Science-based conservation of tree species in Mexico (2015 – 2019), funded by Garfield Weston (GW) Foundation (£ 521,479 British Pounds).
2. Conserving native useful trees of Mexico to maintain its natural capital (2019-2021), funded by Newton Fund (£ 124,556).
3. Using native trees important for local communities to enhance reforestation in Mexico (Veracruz) funded by GW Foundation (Phase 1: 2020-2023, £ 250,000; Aldama Foundation (2022-2027, £250,000); with the support of Herbal Essences to enhance the propagation component (2023, £108,000).
4. Restoring the natural capital of Mexican forests, funded by GW Foundation: 2024-2027, £ 560,000.
5. Enhancing carbon sequestration in shade-grown coffee plantations in the State of Veracruz (2022 – 2025) funded by UK PACT (Phase 1: 2022-2023, £ 131,000; Phase 2: 2023-2025: £423,045) and Emberson Foundation (2023 - 2024, £ 250.000).



# Kew's Programme in Mexico

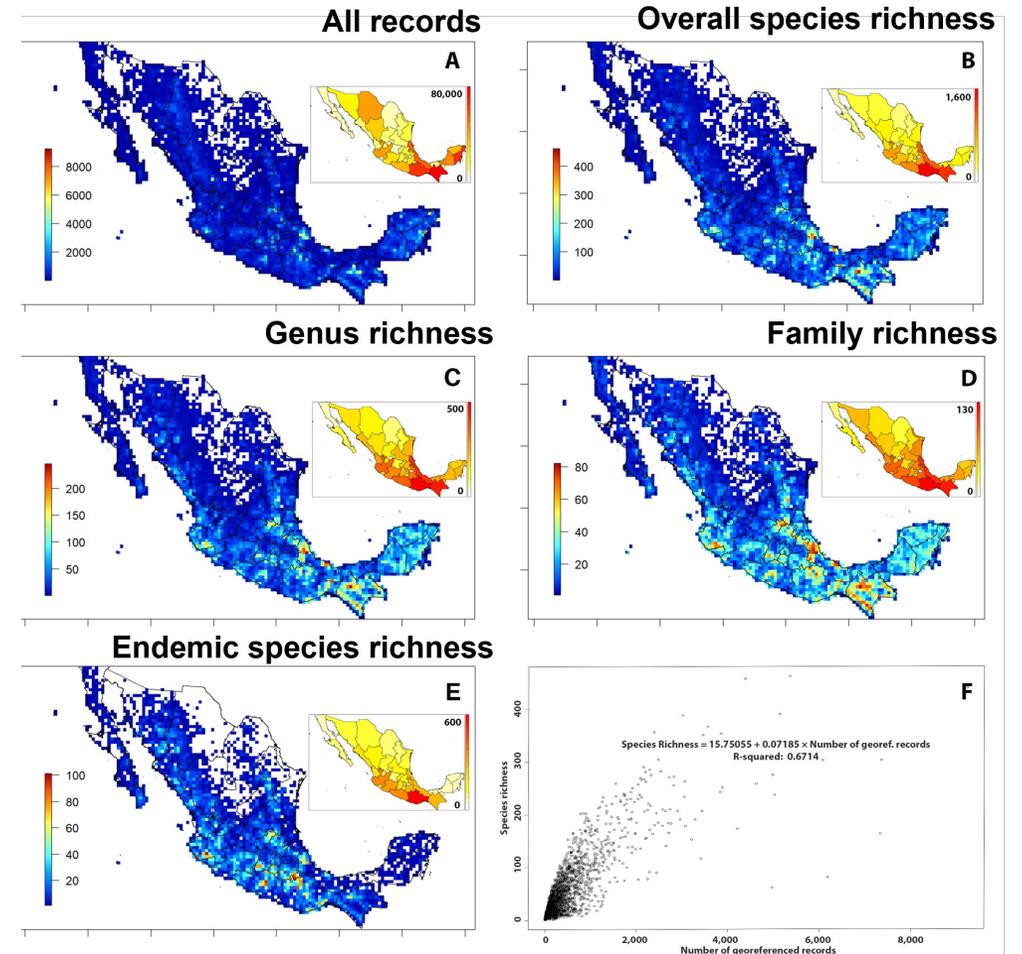


# Targeting



The most comprehensive database and catalogue of native **trees** of Mexico with information on species diversity, geographic distribution, human uses, and conservation:

- **2,885 native tree species**, belonging to 612 genera and 128 families
- **Fabaceae** is the most represented family and **Quercus** the most represented genus.
- Approximately **44%** of tree species are **endemic** to the country
- **674** species have at least one recorded **traditional use**



Tellez, O., Mattana, E., Diazgranados, M., Kühn, N., Castillo-Lorenzo, E., Lira, R., Montes-Leyva, L., Rodriguez, I., Ortiz, C.M.F., Way, M. and Dávila, P., 2020. Native trees of Mexico: diversity, distribution, uses and conservation. PeerJ, 8, p.e9898.



< PLANT BIOLOGY

## Native trees of Mexico: diversity, distribution, uses and conservation

Research article | Biodiversity | Biogeography | Conservation Biology | Plant Science

View 70 tweets

Related research

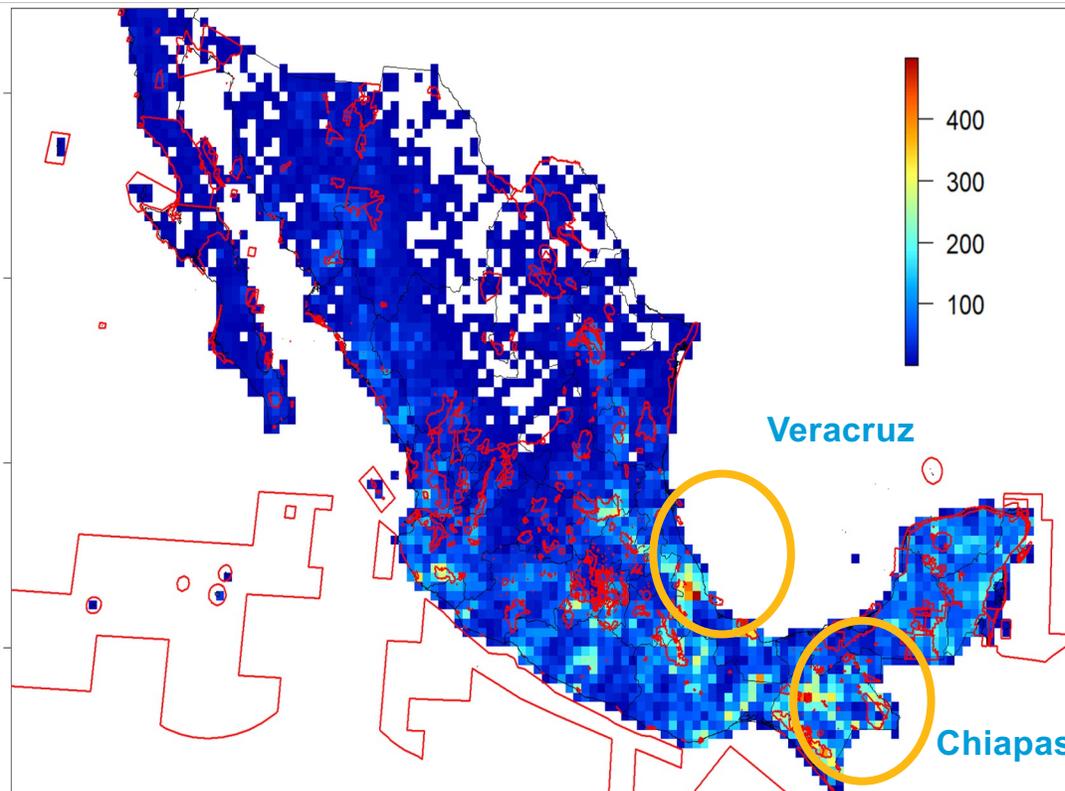
Share

Oswaldo Tellez\*<sup>1</sup>, Efsio Mattana\*<sup>2</sup>, Mauricio Diazgranados<sup>2</sup>, Nicola Kühn<sup>2</sup>, Elena Castillo-Lorenzo<sup>2</sup>, Rafael Lira<sup>1</sup>, Leobardo Montes-Leyva<sup>1</sup>, Isela Rodriguez<sup>1</sup>, Cesar Mateo Flores Ortiz<sup>1</sup>, Michael Way<sup>2</sup>, Patricia Dávila<sup>1</sup>, Tiziana Ulian<sup>2</sup>

# Targeting



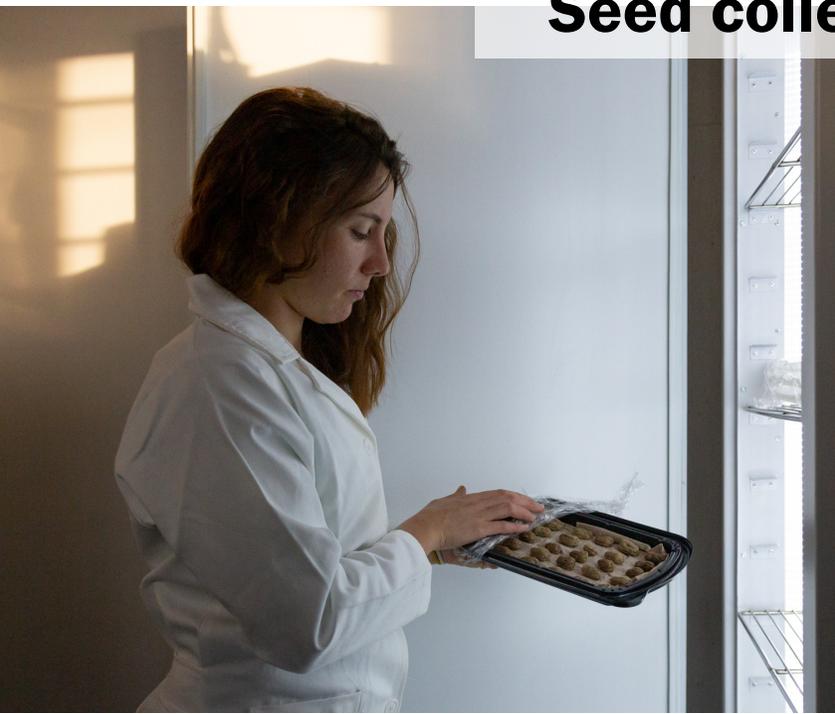
- The Veracruz and Chiapas states were identified as hotspots of biodiversity and conservation needs



Tellez, O., Mattana, E., Diazgranados, M., Kühn, N., Castillo-Lorenzo, E., Lira, R., Montes-Leyva, L., Rodriguez, I., Ortiz, C.M.F., Way, M. and Dávila, P., 2020. Native trees of Mexico: diversity, distribution, uses and conservation. PeerJ, 8, p.e9898.



## Seed collecting, conservation and research



# Propagation & Donation

---



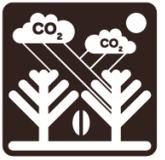
## Planting & Reforestation trials

---





# Local Communities: Training & Marketing



**CAPTURA  
DE CARBONO  
EN CAFETALES  
BAJO SOMBRA**

# Enhancing carbon sequestration and improving livelihoods in shade-grown coffee plantations in the State of Veracruz, Mexico

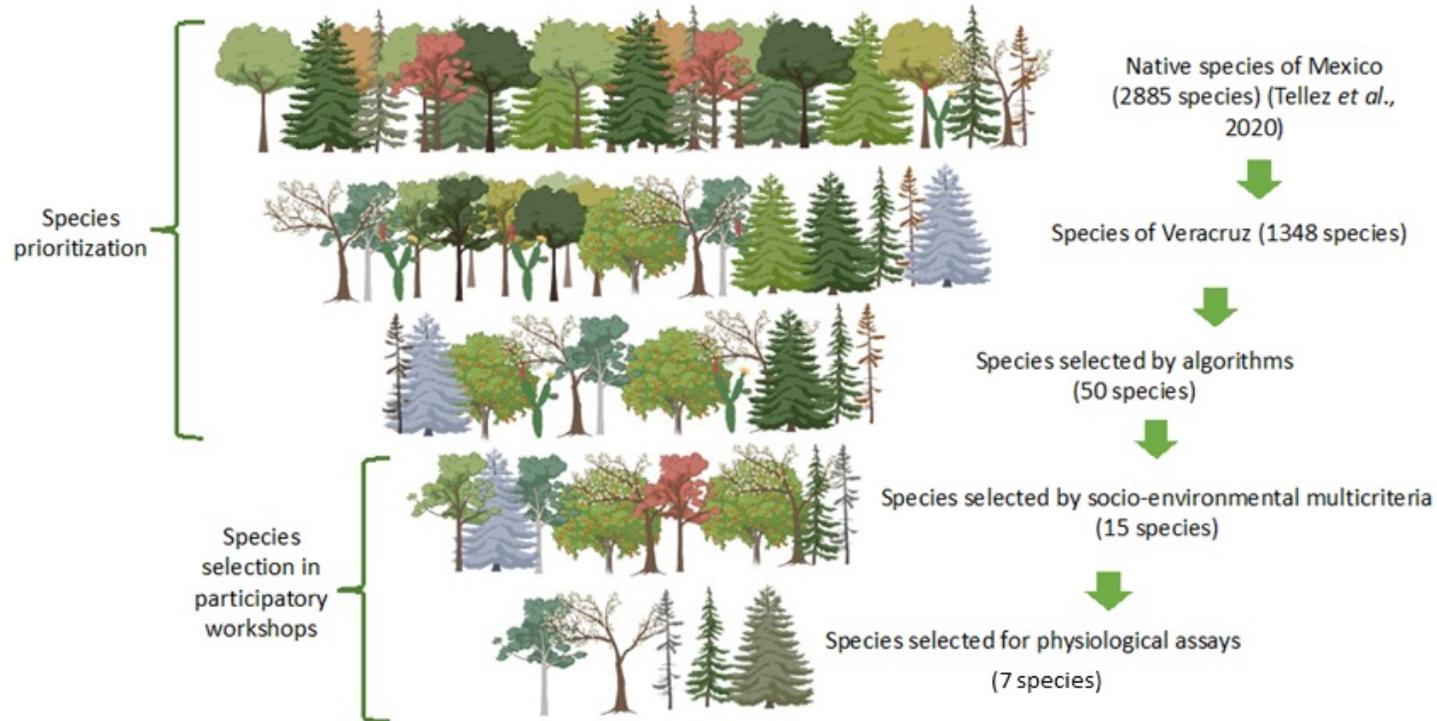


- **Strategic selection of native TREE species**
  - High Carbon Sequestration Capacity
  - Conservation Status
  - Native Distribution
  - Uses
  - Additional economic benefits & ecosystem services identified in participatory workshops with the community (GESI approach)
- **Seed collecting and conservation**
- **Research:** seed germination under different climate change scenarios (resilience) & plant ecophysiology (carbon sequestration)
- **Tree propagation, planting and monitoring**
- **Knowledge Products & Dissemination**
- **Training & Marketing**

**Gender equality and social inclusion (GESI) approach**

# Species selection

Science-based and participatory approach with local communities



1. *Inga vera* Willd.
2. *Inga punctata* Willd.
3. *Erythrina americana* Mill.
4. *Psidium guajava* L.
5. *Heliocarpus appendiculatus* Turcz.
6. *Persea schiedeana* Nees
7. *Inga inicuil* Schltdl. & Cham. ex G. Don



**Gender equality and social inclusion (GESI) approach**

# Knowledge Products & Dissemination



**Pronatura Veracruz** @Pronatura\_Ver · Jan 17  
¿Cómo se obtuvieron las mediciones de parámetros en el campo del proyecto #UKPact "Captura de Carbono en Cafetales Bajo Sombra en Veracruz"?



FES Iztacala UNAM and 2 others



<https://pronaturaveracruz.org/capturacarbono/>

<https://www.kew.org/science/our-science/projects/sequestration-and-livelihoods-coffee>

# Dissemination: species information leaflets

## Usos en la región



Control de la erosión



Alimenticio



Sombra para el cafetal



Leña

siembra  
▼  
cuida  
▼  
protege



CAPTURA  
DE CARBONO  
EN CAFETALES  
BAJO SOMBRA



## Chinini

Nombre científico:  
*Persea schiedeana* Nees

Familia: Lauraceae

## Características principales



Miden 15-20 m de altura, tienen copa grande, ramas gruesas y hojas largas. Es ideal para la sombra en los cafetales.



Miden 15 mm de diámetro, de color amarillo crema y rojo en la base.



*Persea americana* Mill.



## Distribución

**Origen:** América tropical. Se distribuye desde México hasta Colombia.

**Distribución nacional:** Campeche, Chiapas, Oaxaca, Puebla, San Luis Potosí, Quintana Roo, Tabasco, Tamaulipas, Veracruz.

**Altitud:** 100 - 1900 m s.n.m.

**Ecosistemas:** bosque tropical perennifolio, bosque tropical caducifolio y bosque mesófilo de montaña.



## Semillas

**Tipo:** recalcitrante (no se puede almacenar por tiempo prolongado).

Semilla de gran tamaño de color pardo con nervaduras prominentes.

**Polinización:** insectos (abejas).

**Dispersión:** por gravedad (barócora).



## Beneficios para cultivo de café

- Árbol de rápido crecimiento.
- Se usa como cerco vivo.
- Especie de interés comercial, su fruto se vende en mercados locales y es importante como alimento para algunos mamíferos silvestres.
- Este árbol tolera inundaciones.



## Capacidad de captura de CO<sub>2</sub>

**Reserva de C 10 años:**  
275.38 kg/árbol



¿Sabías que un auto recorre 328 km de la CDMX a Coatepec y produce 59.22 kg de CO<sub>2</sub>?

Esto se puede compensar con la captura de C de tres árboles adultos de chinine.



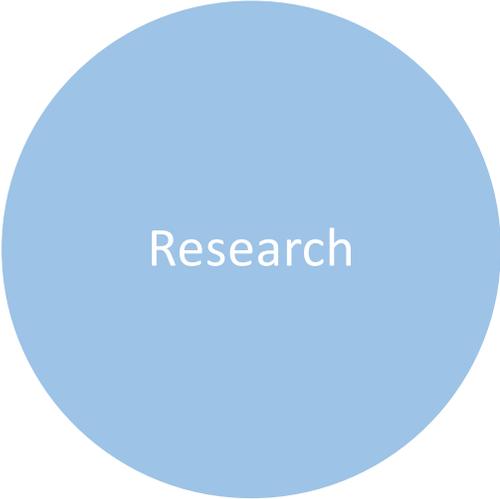
*Persea schiedena* Nees



**Lilia L. Páez**



**Ramón Itza**



## Research

Implementation of a replicable method for carbon sequestration and conservation of native tree biodiversity as an adaptation strategy for climate change in shade-grown coffee plantations.

Scientific validation of the methodology.



## Environmental

Improved carbon sequestration through planting of the selected native tree species with high capacity for carbon sequestration in the State of Veracruz.



## Tree Diversity & ES Conservation

Increased conservation of the TMCF (tree diversity and Ecosystem Services) through the restoration of selected native tree species in the shade-grown coffee plantations of State of Veracruz.

Native tree species with high potential for carbon capture and climate resilience conserved



## Socio-economic

Enhanced economic opportunities generated for smallholder farmers to improve their livelihoods produced, e.g., through the production of higher value coffee and other potential products in shade-grown coffee plantations; access to carbon credits; and creation of ecotourism opportunities in the State of Veracruz.

# Concluding remarks

- **Plant Diversity**, along with the wealth of traditional knowledge about its **uses and practices**, offers a largely **untapped resource** for a sustainable future.
- **Seeds** represent the main **assets** for **Nature based Solutions** to enhance the sustainable use of plants in nature conservation and support a sustainable development model.
- **Seed Banking** is important for the ex-situ conservation of useful plants and safeguarding the ecosystem services they provide directly (e.g., food, medicine, materials, fuel) and indirectly to humans (e.g., soil and water).
- Involvement of **local communities** is critical– through bidirectional knowledge exchange and working closely with organisations in international development, governmental and non-governmental organisations. **Raising awareness** of the benefits of native local plants, e.g., for nutrition/health through communication and developing **marketing options** and **sustainable value chains**.
- **Research & Development**: many knowledge gaps need to be filled to support the **cultivation** and **sustainable use** of useful plants.

## Sources:

Ulian et al. (2020) <https://nph.onlinelibrary.wiley.com/doi/10.1002/ppp3.10145>

Borelli, et al. (2020). <https://www.mdpi.com/2223-7747/9/10/1299>



GROW Webinar

26th Oct 2023, 15:00 – 16:00 CEST

Royal Botanic Gardens

Kew



**Many thanks!**

Dr Tiziana Ulian ([t.ulian@kew.org](mailto:t.ulian@kew.org))

Senior Research Leader - Sustainable Use, Seeds & Solutions, Royal Botanic Gardens, Kew (U.K.)

Visiting Professor, Department of Life Sciences and Systems Biology, University of Turin (Italy)