

MILLENNIUM SEED BANK PARTNERSHIP



Providing quality seed for
Forestry



Dr. Moctar Sacande

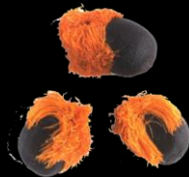
Royal Botanic Gardens, Kew (UK)

m.sacande@kew.org www.kew.org



OUTLINE

1. KEW'S MILLENNIUM SEED BANK (MSB)
PARTNERSHIP
2. MSB AND FOREST SEEDS
3. MSB AND FORESTRY



MAJOR THREATS ON SPECIES

Humans are the main cause of extinction and the principle threat to species at risk of extinction

- Habitat loss and degradation are the leading threats
- Alien species introductions
- Over-exploitation: resource extraction for food and medicine threatens many species
- Pollution and disease
- Climate change induced by humans is increasingly recognised as one of the most serious threats



Slash and burn



Bush fire



Sand dune
encroachment

Over-exploitation

£ / \$



Euro



Why plants are important

Plant-based solutions will be required for all the major environmental challenges:



- Biodiversity conservation
- Food security
- Water scarcity
- Energy
- Human health
- Climate change

PLANT CONSERVATION STRATEGIES

- *In situ* Conservation

Conservation of species in their natural setting, allowing us to maintain natural systems and processes (e.g. National Parks, Natural Reserves, forests)

- *Ex situ* Conservation

Conservation of species removed from their natural setting, safe-guarding them outside their natural habitats; allowing restoration of degraded natural systems (e.g. Botanical Gardens, Seed Banks)

Global Strategy for Plant Conservation – GSPC - CBD

The 16 measurable targets 2011-2020:

Objective 1: Plant diversity is well understood, documented and recognized

Target 1: An online flora of all known plants.

Issues with Communication:

1)- Star anise:

- 'Japanese Star Anise'

(Toxic - *Illicium anisatum* Gaertn. (unresolved!))

- 'Chinese Star Anise'

(Spice - *Illicium verum* Hook.f. (accepted))



2)- Tephrosia:

- *Tephrosia vogelii* Hook.f.

(pesticide plant)

Growing the wrong Tephrosia (Kew News!)



Kew's Millennium Seed Bank partnership



The concept of global seed banking has been proved by the MSB Partnership, and it is based on:

Official partnerships

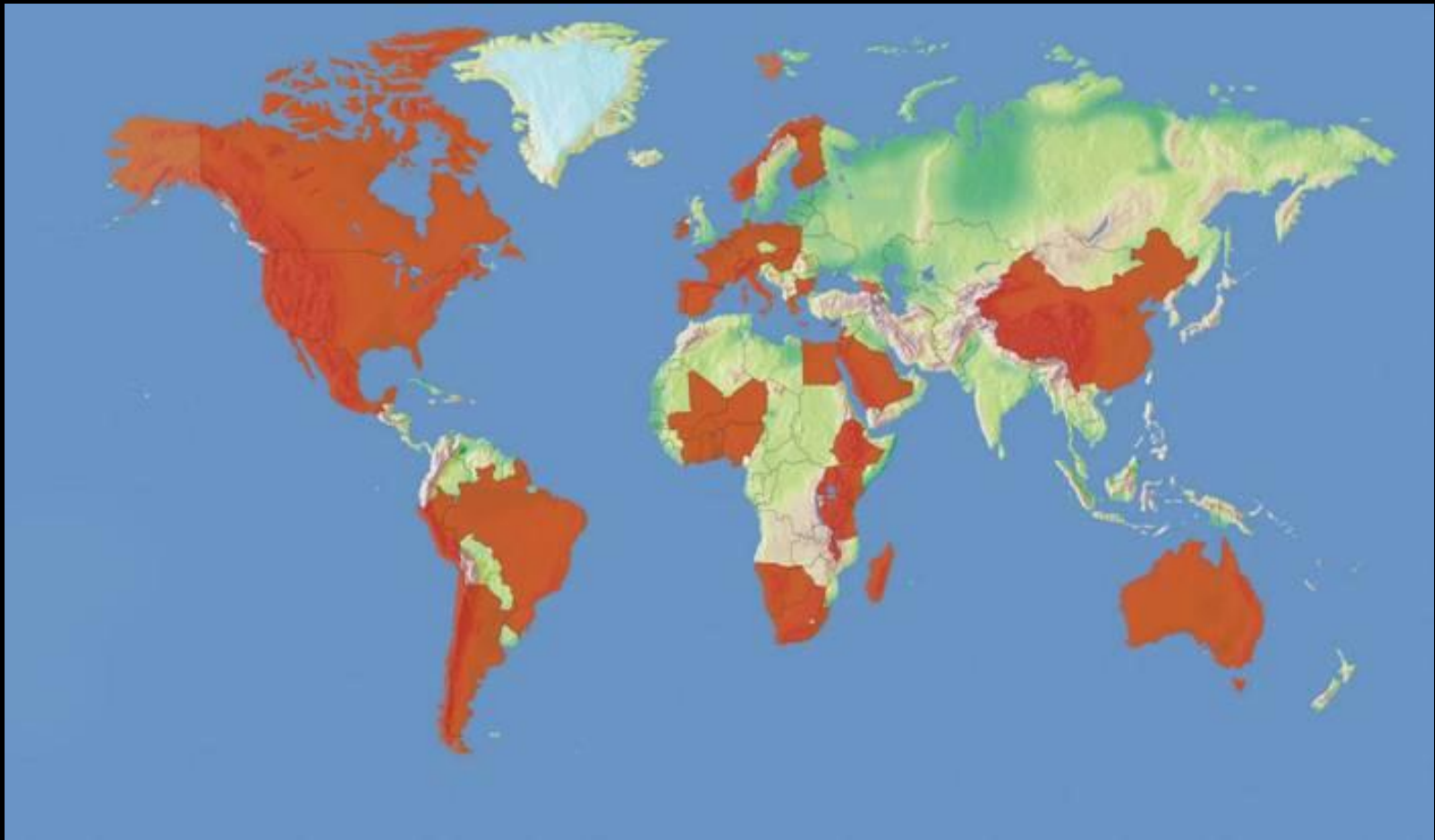
Collections

Training and technology transfer

Enabling use of plant diversity through research

Kew's Millennium Seed Bank partnerships

123 partner institutions in 54 countries



MILLENNIUM SEED BANK

Two main qualities for a seed collection:

1-Genetic quality (desired traits of gene pool...)

2-Physiological quality (regeneration, ..)

TARGETING species to collect
COLLECTING and RECORDING data
CONSERVATION RESEARCH and
BANKING SEED
PROPAGATION and ENABLING USE



TARGETING Herbarium Specimens



Correct Taxonomy



Phenological
information

Location and
Distribution Data

Habitat Information

Plant Description

Hoodia cuneata subsp. *lugardii* (N.E. Br.) Buisson

DET. P. Buisson

19. 93

FLORA OF Rhodesia Date 15. VIII. 1973
Distr. Beitbridge (S)
Coll. L. C. Leach & B. Knott No. 15085
Hoodia lugardii N.E. Br.

Plants scattered but plentiful, with good
regeneration, in restricted area on
sandy mopane flats, near Karoo sand-
stone ridge \pm 30 miles W of Beitbridge.
Plants usually 2'-2'6" high (up to \pm
3'); fls. brick red, often eaten by
caterpillars of "African emperor"

COLLECTING and RECORDING



SEED RESEARCH and BANKING

Seed cleaning, drying (15°C, 15% RH) and testing



Cleaning & drying in country



Cleaning & drying at the MSB



Seed viability, germination,
storability & longevity

Millennium Seed Bank collections

The MSB has the largest wild seed collection in the world – Currently ca. 35,000 species **uplicated** in the Seed Bank (13% of FGR)

A third of collections are of known use

Ca. 10,000 Woody species banked at the MSB

-Ca. 4,000 Tree species banked at the MSB

SEED CONSERVATION

Long term storage of seed:

- at $-18; -20^{\circ}\text{C}$
- at $0; +4^{\circ}\text{C}$

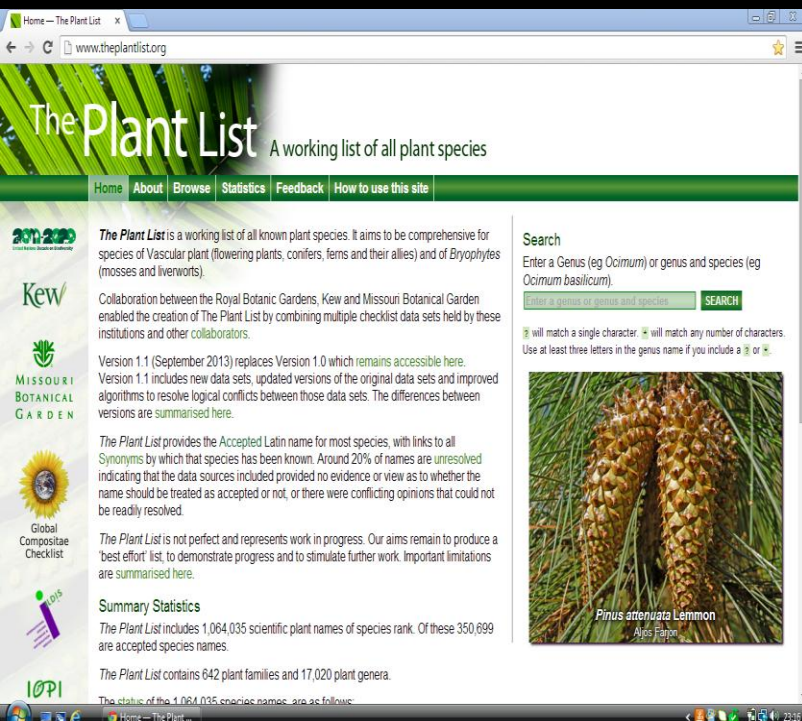


The Plant List

Seed Information Database (SID)

www.theplantlist.org

www.kew.org/sid/



The Plant List is a working list of all known plant species. It aims to be comprehensive for species of Vascular plant (flowering plants, conifers, ferns and their allies) and of Bryophytes (mosses and liverworts).

Collaboration between the Royal Botanic Gardens, Kew and Missouri Botanical Garden enabled the creation of The Plant List by combining multiple checklist data sets held by these institutions and other collaborators.

Version 1.1 (September 2013) replaces Version 1.0 which remains accessible here. Version 1.1 includes new data sets, updated versions of the original data sets and improved algorithms to resolve logical conflicts between those data sets. The differences between versions are summarised here.

The Plant List provides the Accepted Latin name for most species, with links to all Synonyms by which that species has been known. Around 20% of names are unresolved indicating that the data sources included provided no evidence or view as to whether the name should be treated as accepted or not, or there were conflicting opinions that could not be readily resolved.

The Plant List is not perfect and represents work in progress. Our aims remain to produce a 'best effort' list, to demonstrate progress and to stimulate further work. Important limitations are summarised here.

Summary Statistics

The Plant List includes 1,064,035 scientific plant names of species rank. Of these 350,699 are accepted species names.

The Plant List contains 642 plant families and 17,020 plant genera.

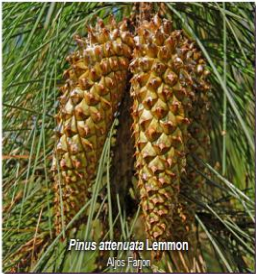
The status of the 1,064,035 names is as follows:

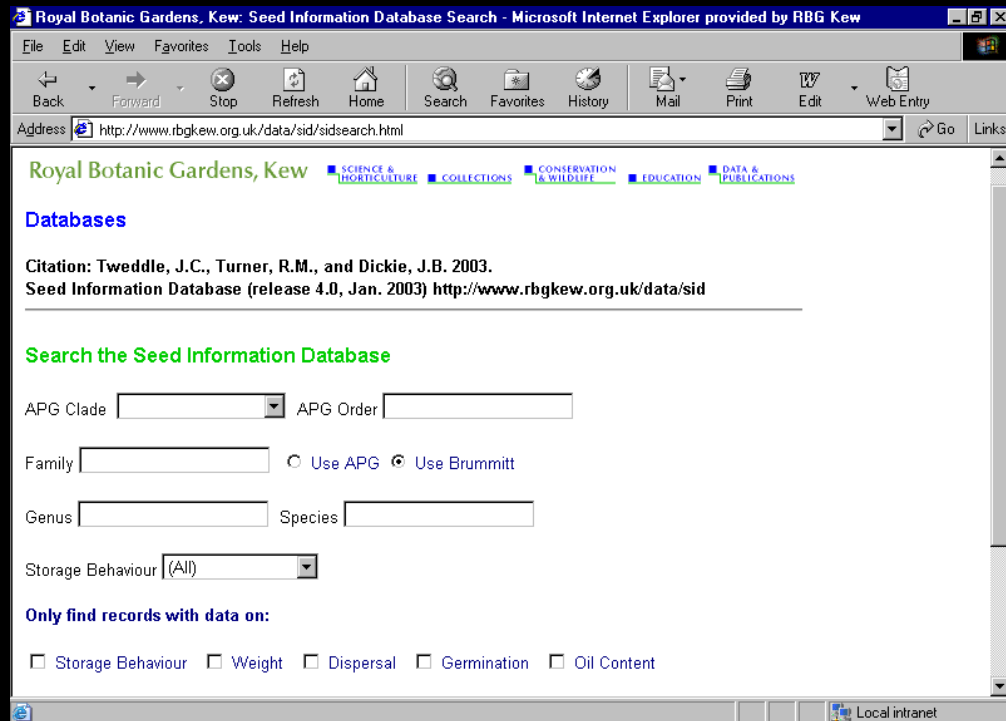
Search

Enter a Genus (eg *Ocimum*) or genus and species (eg *Ocimum basilicum*).

Enter a genus or genus and species

☐ will match a single character. ☐ will match any number of characters. Use at least three letters in the genus name if you include a ☐ or ☐.

 *Pinus attenuata* Lemmon



Royal Botanic Gardens, Kew: Seed Information Database Search - Microsoft Internet Explorer provided by RBG Kew

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print Edit Web Entry

Address <http://www.rbgekew.org.uk/data/sid/sidsearch.html> Go Links

Royal Botanic Gardens, Kew

SCIENCE & HORTICULTURE COLLECTIONS CONSERVATION & WILDLIFE EDUCATION DATA & PUBLICATIONS

Databases

Citation: Tweddle, J.C., Turner, R.M., and Dickie, J.B. 2003. Seed Information Database (release 4.0, Jan. 2003) <http://www.rbgekew.org.uk/data/sid>

Search the Seed Information Database

APG Clade APG Order

Family ☐ Use APG ☒ Use Brummitt

Genus Species

Storage Behaviour

Only find records with data on:

☐ Storage Behaviour ☐ Weight ☐ Dispersal ☐ Germination ☐ Oil Content



THE MILLENNIUM SEED BANK PARTNERSHIP SHARING KNOWLEDGE

The International Plant Names Index

WWW. www.ipni.org

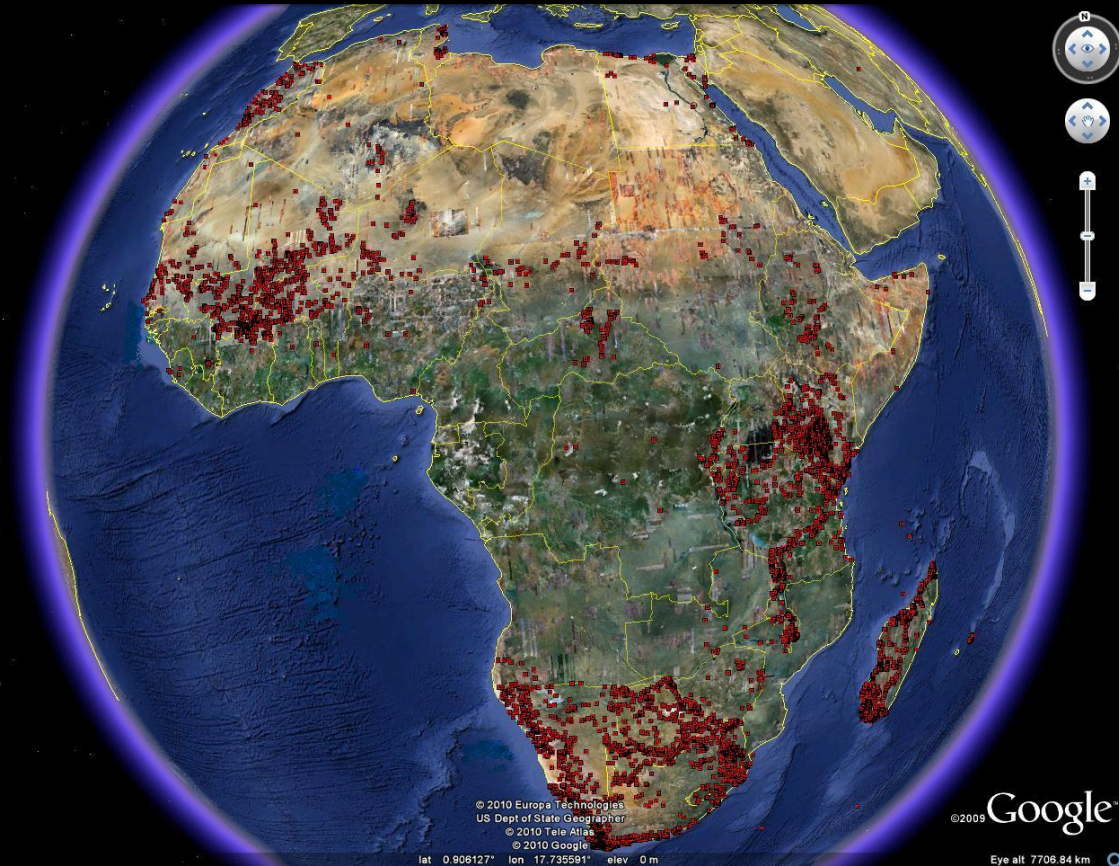
The screenshot shows the IPNI website interface. At the top, it says 'The International Plant Names Index'. Below this is a 'Plant Name Query' section with a 'Quick search' field for entering a plant name without authors. There are also links for 'What's this?' and 'Search'. Below the quick search is a 'Full search' section with fields for Family, Genus, Species, Infrafamily, Infrageneric, and Intraspecific. There is also a field for 'Author' and a 'Publication' section with an 'Abbreviation' field. At the bottom, there are 'Extended Options' including 'Include records from:' (with checkboxes for APNI, GCI, IK, etc.), 'Show Ranks' (set to All), 'Output Format' (set to Normal), and 'Sort by family' (checked). A 'Search' button is at the bottom right. On the left side, there is a 'Search the data' section with links for 'Plant Names', 'Authors', and 'Publications'. At the bottom left, there is a 'contact us' link and a 'Back to IPNI Home' link.

World Checklist of Selected Plant

www.kew.org/wcsp/

The screenshot shows the WCSP website interface. At the top, it says 'Kew' and 'PLANTS PEOPLE POSSIBILITIES'. Below this is a search bar with the text 'Click and enter search term' and a dropdown menu for 'All Kew'. There are also links for 'About Kew', 'Scientific Research & Data', 'Business & Venue Hire', 'Ask Kew', and a shopping cart icon. Below the search bar is a navigation menu with links for 'Visit Kew Gardens', 'Visit Wakehurst', 'Plants & Fungi', 'Science & Conservation', 'Collections', 'Learn', 'Support Kew', 'News', and 'Shop'. The main content area is titled 'World Checklist of Selected Plant Families' and includes a 'Quick Search' section. This section explains that the checklist gives information on accepted scientific names and synonyms of selected plant families. It also mentions that the checklist includes 151 Seed Plant families and provides a link to 'View list of included families or reviewers'. Below this is a 'Search for a family, genus, or genus plus species e.g. *Amalia acuminata*' section with a 'Search' button and a 'Find name' button. At the bottom, there is a note about the currency of science and a link to 'contact Rafael Govaerts'. On the right side, there is a 'World Checklist' sidebar with links for 'Checklist Home', 'Advanced Search', 'About the Checklist', 'History', 'Structure', 'Names', 'Geography', 'Life-Forms', 'Abbreviations', 'Build a Checklist', 'Compilers & Reviewers', 'How to make a contribution', 'Contact us', 'How to cite us', 'World Checklist', 'Publications', 'F.A.Q.', 'Terms of use', and 'Help'.

AFRICA WILD SPECIES COLLECTIONS AT THE MSB



- Ca. **51,000** wild species in Africa – **25% banked at MSB**
- **> 1,000 species important to local communities**

Enabling use through research



Development of germination protocols are a vital and novel output of the MSB

Currently >10,000 germination tests carried out each year. For most species the methods are new.

All germination protocols are available on Kew's website at <http://www.kew.org./data/sid>



Afforestation and restoration

Monoculture planting for restoration are prone to disease, pests, extreme weather events and climate change.

More complex ecosystems need to be constructed or put back in order to ensure resilience.



Community-based programme

- 1) Useful Plants Project (since 2007 - 50 communities in 8 countries);
- 2) Tree planting initiative (since 2010 - 20 community groups in 6 countries)
- 3) Great Green Wall restoration project (since 2013 - 76 villages in Burkina, Mali and Niger)





MSB Community programme



Village tree nursery in Boamadumasi, **Ghana**, producing native chew-stick species (*Garcinia kola*).



Community tree nursery looked after by a women group in **Kenya**.



Native useful species production as seedlings in Sikasso nursery, **Mali**.



Community nursery producing seedlings of local species for a restoration project in Tera, **Niger**.



Collection of *Moringa oleifera* seeds, the 'miracle tree' with many properties, in **Burkina Faso** (CNSF),



Native seedling production of Gum Arabic (*Acacia senegal*) for the GGW in Dori, Burkina Faso .

The right species in the right PLACE



Carapa procera,
planted in 2008



Anogeissus leiocarpus,
planted in 2008



Melia volkensii,
planted in 2013

Strategic Priority 6:

- Promote the establishment and development of efficient and sustainable *ex-situ* conservation programmes, including *in-vivo* collections and **genebanks**.

Strategic Priority 12:

- Develop and reinforce national seed programmes to ensure the availability of genetically appropriate tree seeds in the quantities and of the (certified) quality needed for national plantation programmes.

Conclusions

1. Technically we have and we know what is needed to succeed restoration programmes
2. Do contribute to make it a SUCCESS



