“Issues and experiences from the use of databases recording genetic resources and associated traditional knowledge, and their potential for use as a defensive measure”.

WIPO Roundtable, Geneva, 27 May 2016
China Williams
Senior Policy Officer
Royal Botanic Gardens, Kew
Royal Botanic Gardens, Kew:
Non-departmental public body and registered charity
700 staff (250 in science)
Over 1 million visitors each year
UNESCO World Heritage Site
19 major collections:

Preserved plant and fungal collections (Herbarium)

Living material (The Millennium Seed Bank, living plant collections)

Documentary and visual reference collections (library, art and archives, on-line resources including databases)
Kew’s Collections in Numbers

Herbarium (7.5 M) & Fungarium (1.25 M)
Living collections (+30,000 species)
Millennium Seed Bank (+30,000 species; c. 2 billion seeds)
Over 40 open access science databases
DNA and tissue bank (+42,000 accessions)
DNA C-value (+7,000 species)
Slide collections (+100,000 slides)
Library (> 750,000 volumes), archives (250,000), artwork (> 175,000), paintings, prints and drawings
Hundreds of scientists visit each year
Over 60 overseas plant collecting trips per year
Exchange over 60,000 herbarium specimens and 10,000 live plants and seeds each year
Kew’s Economic Botany collection was founded in 1847. It contains about 90,000 plant raw materials and artefacts representing all aspects of craft and daily life worldwide, including medicines, textiles, basketry, dyes, gums and resins, foods and woods.
‘At least 31,128 plant species currently have a documented use’

Publicly available databases maintained by Kew

**The Plant List**

**General**
- ePIC (electronic Plant Information Centre)
- Kew Bibliographic Databases (KBD)
- Library Catalogue

**Economic Botany**
- Economic Botany Bibliographic Database (part of KBD)
- Economic Botany Collection
- SEPARASAL Database (Survey of Economic Plants for Arid and Semi-Arid Lands)

**Molecular and Genome Biology**
- Plant DNA C-Values Database
- DNA Bank Database

**Morphology**
- Plant Micromorphology Bibliographic Database (PMBD) (part of KBD)
- Inside Wood (collaborative database at North Carolina State University)
- Floral Reflectance Database (FReD) (collaborative database at Queen Mary College, University of London)

**Nomenclature, Taxonomy and Systematics**
- Herbarium Catalogue
- Flora Zambesiaca online (eFloras)
- Flora of West Tropical Africa
- Fungarium Catalogue IMI
- Fungarium Catalogue K(M)
- Index Fungorum
- IPNI (International Plant Names Index)
- Malpighiales Scratchpad
- Medicinal Plant Names Services Portal
- Neotropikey (interactive key and data resources for Latin American plants)
- Neotropical Plant Image Database
- Neotropical Vegetation Data (interactive resource)
- Vascular Plant Families and Genera Database
- World Checklist of Monocotyledons
- World Checklist of Rubiaceae
- World Checklist of Selected Plant Families
- World Grass Species - descriptions
- World Grass Species Synonym Database (download)

**Seeds**
- Cactus Seed Biology Database on CD-ROM - email MSBSci@kew.org for further information
- Millennium Seed Bank Seed List
- Seed Information Database
- Reforestation in Southern Bahia
- The Millennium Seed Bank Partnership Data Warehouse

www.kew
Kew’s database focus: A global name resources

Kew curates global authoritative references for:

- **Plant names (1 & 2)** and Plant taxonomy (3 & 4)
- 1. International Plant Name Index (IPNI)
- 2. Index Fungorum
- 3. World Checklist
- 4. The Plant List

**Lists all published names:** 1.6 million
Questions it answers:
- Does this name exist?
- Where name published?
- Well curated and up to date

**Lists plants:** synonymy, habit, geography, evidence
Question it answers:
- What is current name – who says so?
- What are all synonyms?
- Where is the plant found?
- What plants are in Cyprus?
Top quality: peer reviewed and up to date
But... only 40% complete!

**First complete lists of plants:** synonymy and taxonomy
All species and all genera for all families
Questions it answers:
- What is current name – who says so?
- What are all synonyms?
Static – not updated
Quality variable - known gaps and errors
Last updated in 2013 using data sets from 2012
Most widely used (3 million visits / 1.4 million users in 2015)
Policies for collecting genetic resources and associated traditional knowledge

Kew has developed:

- A Policy on Access to Genetic Resources and Benefit Sharing
- Guidelines for Staff Working with Traditional Knowledge
- An overseas fieldwork policy that ensures legal collection of genetic resources and associated traditional knowledge
- Model agreements and clauses to ensure material and information is collected with PIC and on MAT, according to international, national and local legislation

Databases recording use overwhelmingly rely on:

- aTK already cited in published literature

IF TK from third party source (unpublished data) or, rarely, TK direct from knowledge holder this will ALWAYS involve a bilateral agreement covering:

- PIC (including for publically available databases)
- MAT (terms of use clear)
- source of TK recorded in all references
- terms of use, layers of access to information, publication rights if allowed (local names, germination techniques, location, high level description of use etc.)
Vigna angularis  
(adzuki bean)

**Uses:** Many species are major pulse, vegetable, fodder and green manure crops, e.g., *V. angularis* (Willd.) Ohwi & H.Ohashi (azuki or adzuki bean) ; *V. mungo* (L.) Hepper (urd bean, black gram) ; *V. radiata* (L.) R.Wilczek (mung bean, green gram) ; *V. umbellata* (Thunb.) Owhi & H.Ohashi (rice bean) ; *V. aconitifolia* (Jacq.) Maréchal (moth bean) ; *V. unguiculata* (L.) Walp. (cowpea, yard long bean) and *V. subterranea* (L.) Verdc. (bambara groundnut, bambara bean)
SEPASAL - world's most comprehensive online source of information on useful 'wild' and semi-domesticated tropical and subtropical dryland plants, with a focus on Africa.

'useful' - plants which humans eat, use as medicine, feed to animals, make things from, use as fuel, and many other uses.

The database contains information on approximately 7,000 species.

SEPASAL 'nodes' were in operation at the National Museums of Kenya (NMK) and the National Botanical Research Institute of Namibia (NBRI).

SEPASAL uses a number of international (TDWG) standards for recording plant information, including for recording plant uses

Access to the database involves REGISTRATION.
Agreement with Government of Kenya, represented by the Ministry of Environment and Natural Resources

SEPASAL database includes data *already in public domain*, currently located in paper files and publications.

This was done through a portal based in NMK, Kenya, funded by the project

*(Kenyan authorities and partners)* ‘shall ensure that the Plant Material and any associated ITK is collected in accordance with all applicable laws of Kenya and regulations and in particular that each and every necessary permit and or prior informed consent and or licence in connection with the collection of and/or any subsequent use of the Plant Material and any associated ITK by the Partners has been obtained’.

‘Publication or disclosure to a Third Party of confidential ITK may only take place once the written prior informed consent of the original holder(s) of that ITK has been obtained. Unauthorised Disclosure of confidential ITK is not permitted.

*No primary information or data collected.*
Project MGU* - the Useful Plants Project, aims to enhance the *ex situ* conservation of native useful plants for human wellbeing by building the capacity of local communities to successfully conserve and use these species sustainably. Since 2007 the project has been working with partners in Botswana, Kenya, Mali, Mexico, Mozambique and South Africa.
Useful Plants Project – San Rafael, Mexico

Project carried out with the community of San Rafael, Coxcatlan, Puebla, Mexico - to conserve seeds of important useful plants.

Initially 117 plant species belonging to 38 families, seed banking of 98 in Seed bank in Mexico, duplicates in Kew.

Total of 80 are useful, and 17 recognised as highly important by the community.

Twenty medicinal species analysed for phytochemical studies, which corroborated the existence of plant substances that justify their use in traditional medicine in San Rafael.

Project Aim – to reinforce respectful attitude to towards conservation and sustainable use among community, to design propagation protocols for most important and threatened plants, to elaborate a programme for sustainable use and marketing of useful plants or their plant products in order to promote income generation in the communities, to promote the area by contributing to ecotourism.

Agreement with UNAM (National Autonomous University of Mexico):

‘for the avoidance of doubt, all associated traditional knowledge shall only be used as agreed by the relevant local or indigenous community and in accordance with applicable Mexican legislation and the letter and spirit of Article 8(j) of the CBD.

• TK collected in country, by knowledge holders.
• Stored on BRAHMS database – not publically available.
• Use and reference recorded.
• No permission to publish or use beyond community.
Proyecto equilíbrio entre conservação e meios de subsistência na floresta Chimanimani

Interview consent form
MICAIA and The Royal Botanic Gardens, Kew have been working together for two years to support the conservation and sustainable use of plant resources in the Chimanimani forest belt. The project aims to address problems related to population growth and poverty which affect the natural environment. Our project’s objectives are to:

- Identify important areas for conservation of habitats and plants
- Support the development and implementation of land use plans by community Natural Resource Committees and community rangers.
- Help promote sustainable ways to use natural resources.
- Develop ecotourism further in the area, in collaboration with communities

As part of our work we are recording information on traditional uses of plants with the aim of preserving this knowledge in a database for future generations to access. It will also be available to help deal with important challenges to people’s livelihoods such as those caused by a changing climate.

The information collected by the project will not be used for commercial purposes or financial gain.

However, this information may be included in locally available educational publications, scientific publications and used in local training and education programmes.

The project recognizes all contributions made by informants. As such, their names will be mentioned in any publication, unless they wish to remain anonymous.

To share my knowledge of plants and their uses, I will be supporting the project.

Name: ________________________________ Age: ______

Community: ________________________________

I give my permission to use the information I provide for the reasons stated above.

☐ I would like to remain anonymous

(Signature) __________________________________________

(Date) _______________________

Interview number: ____________

Information not made publically available
Data collected on the uses of plants becoming increasingly important. Standardisation of terms and a unified system to describe uses are of enormous benefit to gatherers of information, especially where exchanges of data sets are involved. One such standard is: Cook, F.E.M. (1995). Economic Botany Data Collection Standard. Prepared for the International Working Group on Taxonomic Databases for Plant Sciences (TDWG). The standard provides a system whereby uses of plants (in their cultural context) can be described, using standardised descriptors and terms, and attached to taxonomic data sets. It resulted from discussions at the International Working Group on Taxonomic Databases for Plant Sciences (TDWG) between 1989 and 1992.
Enabling effective communication in health, regulation and research

Medicinal plants are used globally and are known by different names in different communities, health traditions, generations and languages.

The same name can also be applied to different species.

Thus to find all the information published about a particular plant, and to ensure that you are sharing data about the same species, you need to know all the possible names that have been used, and any possible confusions.

The MPNS resource is built by collecting plant names from medicinal plant literature, this includes:
- pharmacopoeias
- monographs
- ethnobotanical surveys
- regional works
Mu Xiang - widely used Chinese Herb

- Flora of China: “Aucklandia costus Falc.”
- Pharmacopoeia: China and Korea: “Aucklandia lappa Decne”
- US Herbs of Commerce (FDA): “Saussurea costus (Falc.) Lipschitz”
- Pharmacopoeia: Japan & Ayurvedic: “Saussurea lappa Clarke”
- Many more scientific synonyms
Please enter a NAME to search the MPNS resource:

Mu Xiang  All names  GO

16 records matched your search. These records relate to:

7  Accepted scientific names
9  Scientific names as used in medicinal plant references
9  Non-scientific names
4  Medicinal plant references
16  All records

<table>
<thead>
<tr>
<th>Accepted scientific names</th>
<th>Records referring to name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aucklandia costus Falc.</td>
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<tr>
<td>Inula helenium L.</td>
<td>3</td>
</tr>
<tr>
<td>Dolomiae souliei (Franch.) C.Shih</td>
<td>2</td>
</tr>
<tr>
<td>Syzygium aromaticum (L.) Merr. &amp; L.M.Perry</td>
<td>2</td>
</tr>
<tr>
<td>Vladimiria souliei var. cinerea Y.Ling</td>
<td>2</td>
</tr>
<tr>
<td>Aquilaria sinensis (Lour.) Spreng.</td>
<td>1</td>
</tr>
<tr>
<td>Aristolochia debilis Siebold &amp; Zucc.</td>
<td>1</td>
</tr>
</tbody>
</table>
Accepted scientific name:


**Taxonomic source:** World Checklist - unpublished

**Family:** Asteraceae

### Non-scientific names for this plant and parts used:

<table>
<thead>
<tr>
<th>Non-scientific name</th>
<th>Class of name</th>
<th>Trade forms</th>
<th>Plant parts</th>
<th>Medicinal plant reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>aucklandia</td>
<td>Other</td>
<td>dried root</td>
<td>root</td>
<td>Herbs of Commerce (McGuffin et al., 2000)</td>
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<td>Aucklandiae Radix</td>
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<td>root</td>
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<tr>
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<td>Other</td>
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<td>root</td>
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<tr>
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<td>root</td>
<td>Pharmacopoeia of China 2005</td>
</tr>
<tr>
<td>Common Aucklandia Root</td>
<td>Other</td>
<td>dried root</td>
<td>root</td>
<td>Pharmacopoeia of China 2010</td>
</tr>
<tr>
<td>costus</td>
<td>Other</td>
<td>dried root</td>
<td>root</td>
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<tr>
<td>Costus Root Oil</td>
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<tr>
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<td>Other</td>
<td>dried root</td>
<td>root</td>
<td>Siddha Pharmacopoeia India, vol. 1 (2008)</td>
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<tr>
<td>Kud</td>
<td>Other</td>
<td>dried root</td>
<td>root</td>
<td>Ayurvedic Pharm. of India (1999-2011)</td>
</tr>
</tbody>
</table>
Accepted scientific name:


Taxonomic source: [World Checklist - unpublished](#)

Family: Asteraceae

Further information:

The following online resources may contain further information about this plant. Please click on any link to search that resource. You can choose to search by the accepted name only or the accepted name plus all of its synonyms.

<table>
<thead>
<tr>
<th>Search using just the accepted name:</th>
<th>Search using all scientific names used for this plant:</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Center for Biotechnology Information</td>
<td>GenBank — Nucleotide Alphabet of Life</td>
</tr>
<tr>
<td>Google Images</td>
<td>Google Images</td>
</tr>
<tr>
<td>Wikispecies</td>
<td></td>
</tr>
<tr>
<td>eol Encyclopedia of Life</td>
<td></td>
</tr>
</tbody>
</table>
Huge amount of information available in published literature (historic and recent) – how can this be accessed efficiently?
New initiative from Kew

Online global resource for plants: the Plants of the World Online Portal (POWOP). Single point of access for authoritative information on plant species, from anywhere in the world.

The Useful Plants and Fungi Portal will be an online resource providing information on the economic and traditional uses of plants and fungi.

Data for the portal will be drawn from existing Kew databases, such as SEPASAL (Survey of Economic Plants for Arid and Semi-Arid Lands) and the Kew Economic Botany Collection, and from research into species important for food security, livelihoods and human health.
Issues, recommendations and opportunities

- Databases usually created for a particular reason or project
- Information on use not collected systematically
- Information on use often not databased or available online
- Use information is spread across many databases – how to bring information together?
- Many project databases have no permission to make public, or subject to different terms of PIC in bilateral agreements
- Use information is fragmented, and there is no single entry point to this information

Important for searches to be consistent – names, use etc.
- Uses need to have been systematically collected
- Permissions for access need to be clear
- Kew’s expertise in taxonomy and naming could be useful in ensuring systematic and accurate searches
- Increase dialogue with new database initiatives – e.g. Useful Plants and Fungal Portal
References and acknowledgements

I am very grateful to the following people at RBG, Kew for help with the preparation of this talk:

Alex Hudson (Useful Plants Project)
Professor Monique Simmonds
Bob Allkin (MPNS)
Mark Nesbitt (Economic Botany)
Pete Gasson

References

All Kew’s publically available databases can be accessed here: www.kew.org/kew-science/people-and-data/resources-and-databases


The 2016 State of the World’s Plants report can be accessed here: https://stateoftheworldsplants.com/