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# Ecogeographic data acquisition and verification

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SADC Crop Wild Relatives

*In situ* conservation of CWR and diversity assessment techniques

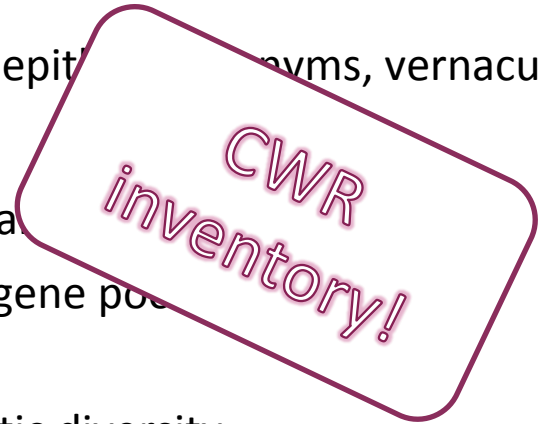
Regional training workshop. 10-13 November 2014, Mauritius

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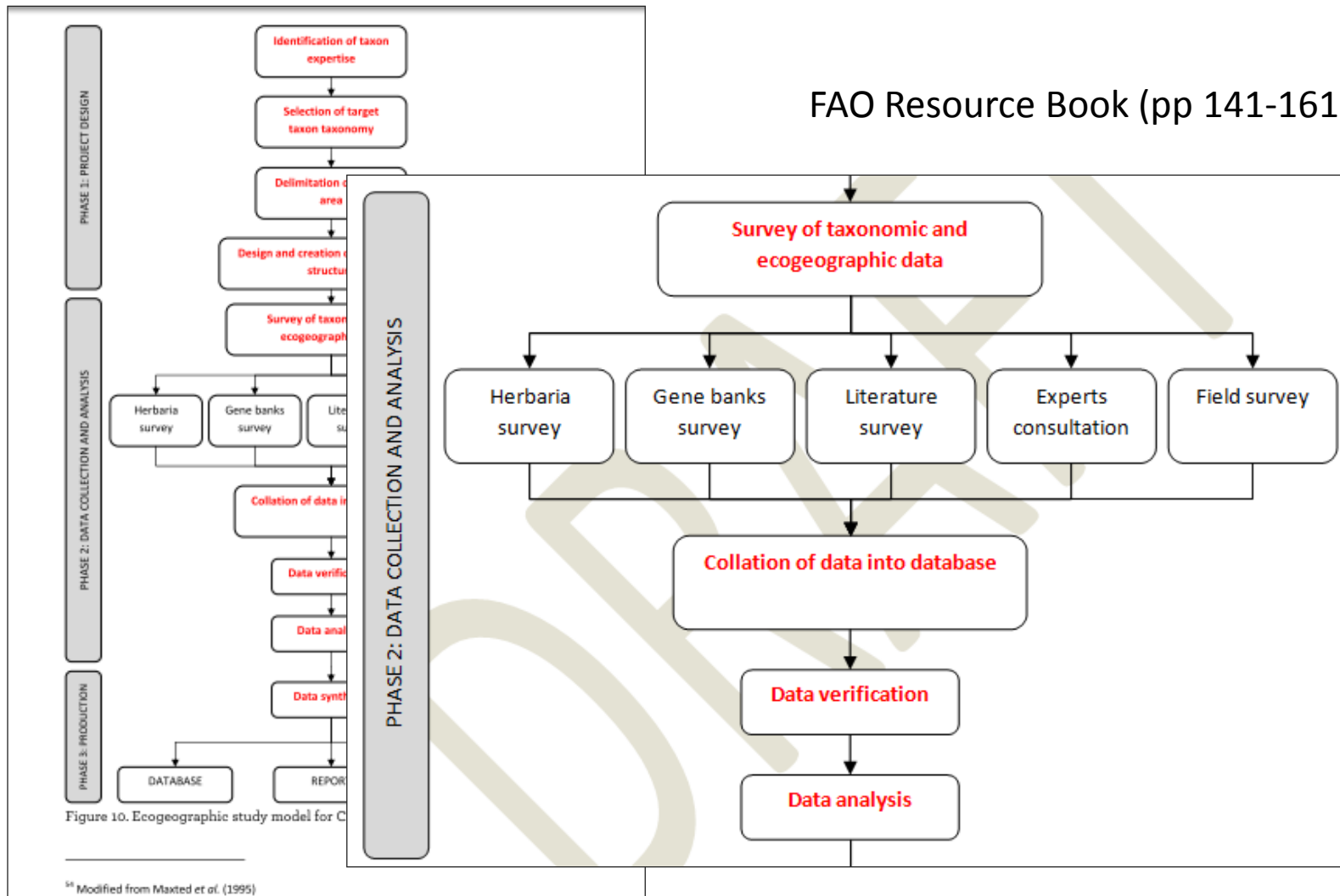
# Main ecogeographic data types

- ❑ Taxonomic: genus, species, authority, infra-specific epithets, synonyms, vernacular names
- ❑ Taxon biology: pollination, phenology, seed dispersal
- ❑ Related crop: degree of relatedness to crop taxon (gene pool)
- ❑ Distribution: location, coordinates
- ❑ Population characteristics: size, age structure, genetic diversity
- ❑ Environmental data: habitat, geological, topographical, climatic, edaphic, land use
- ❑ Conservation: threat status, *in situ* and *ex situ*, legislation
- ❑ Characterization data: e.g. leaf shape, flower colour, plant habit, seed colour
- ❑ Ex situ evaluation data: plant height, days to maturity
- ❑ Utilization potential: previous use as trait donor, potential use as trait donor



# Sources of ecogeographic data for spatial analysis

FAO Resource Book (pp 141-161)



# Sources of ecogeographic data for spatial analysis



## HERBARIA

- national and international
- online



## GENEBANKS

- national and international
- online



## SCIENTIFIC AND 'GREY' LITERATURE

- floras, monographs, recent taxon studies, scientific papers
- reports of Environmental Impact Assessment studies
- databases

# Sources of ecogeographic data for spatial analysis



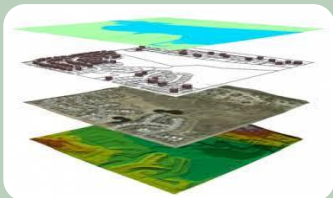
## EXPERT CONSULTATION

- taxon experts
- geographic experts
- breeders



## FIELD SURVEY DATA

- (especially important when not enough data available)



## GIS LAYERS – ABIOTIC DATA

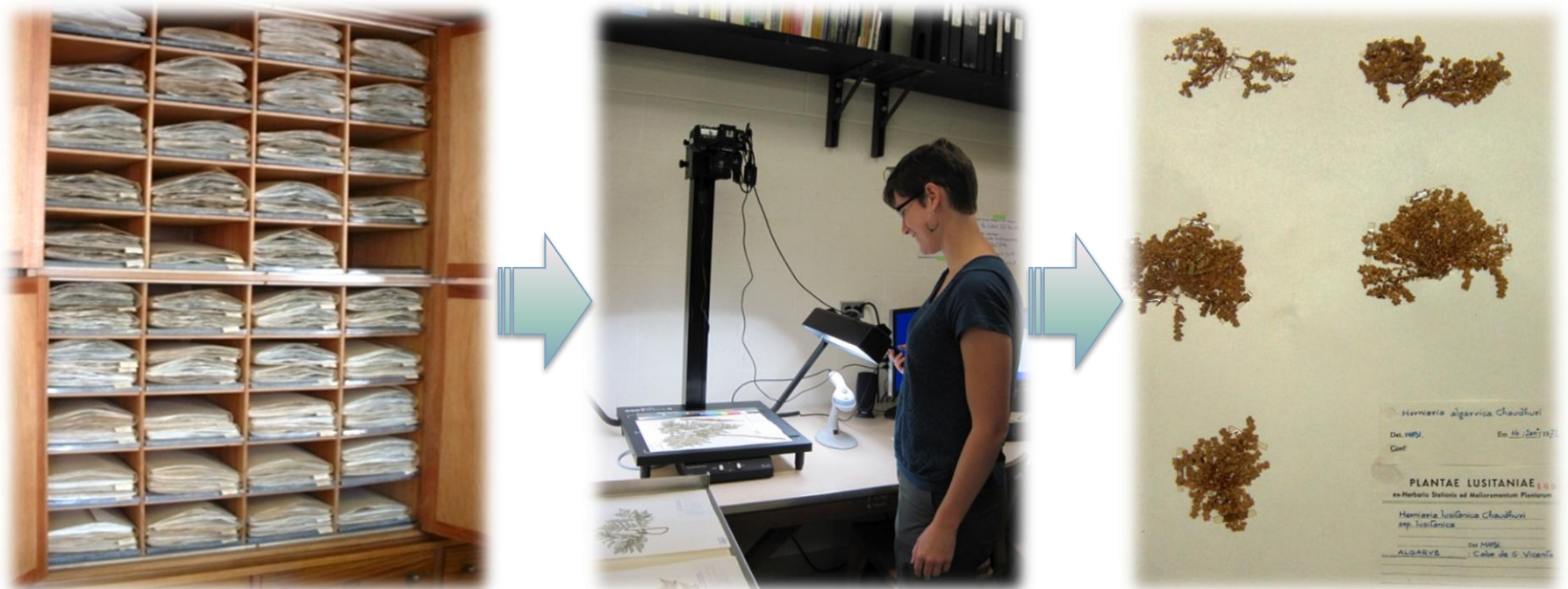
- bioclimatic (temperature, precipitation, indexes), edaphic, geophysic (altitude, slope, aspect)
- CAPFITOGEN (data and ELC maps)

# Herbarium data

- Quality of data recorded
- Basic location but poor ecological data
- Hand written
- Foreign language
- Check identification



# Digital recording of passport data - herbaria





# Digital recording of passport data

## BEFORE DIGITIZATION

- Obtain permission to photograph
- Be careful when manipulating specimens
- Offer to provide the host with the digitized photos

## EQUIPMENT REQUIRED

- Digital camera (min. 6 MP)
- Storage devices (SD) cards
- Extra battery for camera
- External hard disk
- List of target taxa
- Notebook to record the process of data collation
- Paper tags 'Fl', 'Fr', 'Inflo' (Poaceae)



# Digital recording of passport data

## SELECTING THE SPECIMENS TO PHOTOGRAPH

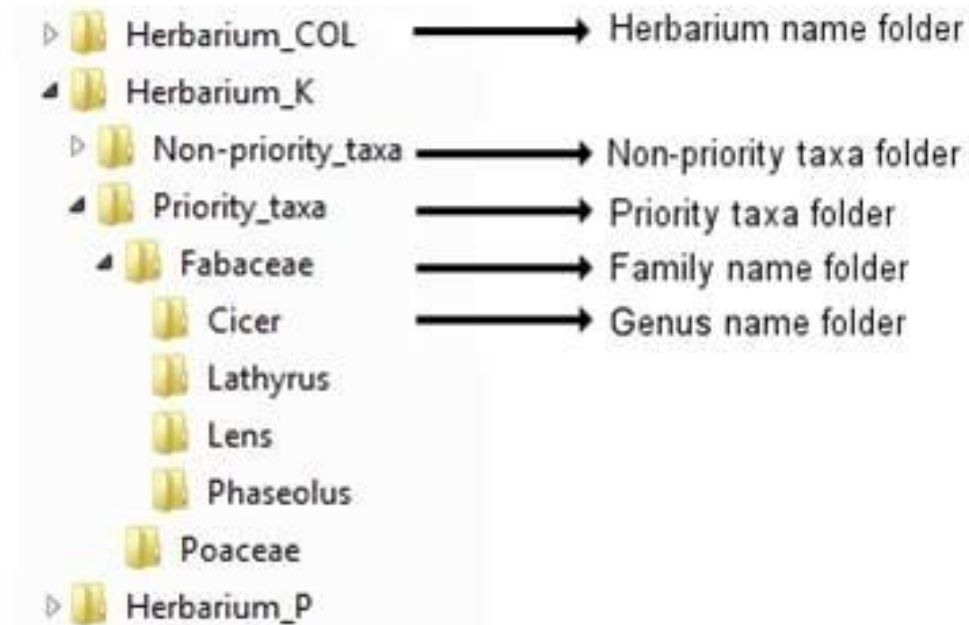
- Identify the system the herbarium follows to organize the collection and plan the digitization within the time available
- Avoid over-digitization of some taxa at the expense of neglecting other priority taxa.
- Start with the highest priority taxa.

## RECOMMENDATIONS WHEN TAKING THE PICTURES

- Use maximum resolution
- Photograph the label of the specimen folder in order
- Photograph the whole specimen sheet and include all annotations
- Photograph the herbarium label, determination label and any additional annotation in close-up
- Review the images after taking them and repeat when needed
- Use the “macro” option for taking the photograph
- Avoid the use of flash
- Make back-ups of all photographs taken

# Digital recording of passport data

## ORGANIZING THE IMAGES



# Data verification

- Assess completeness of the data set
  - certain analyses not possible if it is incomplete
- Standardize data format

Table 2. Examples of location data and their corresponding level of accuracy<sup>57</sup>.

| Level of accuracy | Location data  |
|-------------------|--|
| 1                 | Exact place (e.g. 21 km along the road between location x and location y). |
| 2                 | Within a defined area of 1 km <sup>2</sup> .                               |
| 3                 | Within a defined area of 10 km <sup>2</sup> .                              |
| 4                 | Within a defined area of 20 km <sup>2</sup> .                              |
| 5                 | Within a defined area of 100 km <sup>2</sup> .                             |

FAO Resource Book (pp 150)

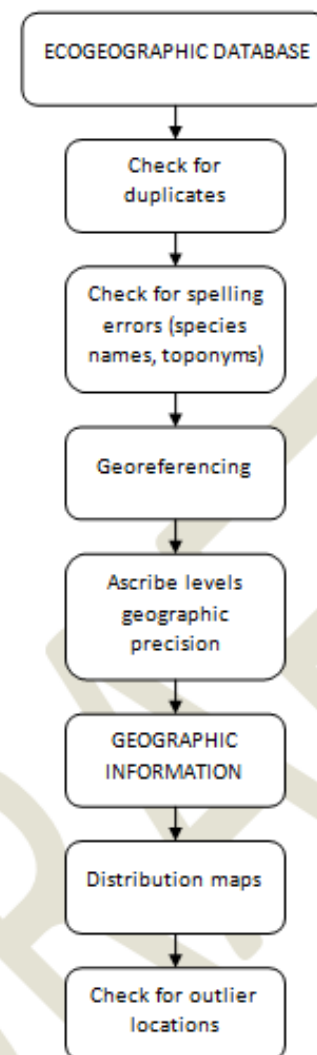


Figure 12. Schematic representation of ecogeographic data verification

# Data verification - example

## Herbaria survey

- 10 Portuguese herbaria and 1 Spanish herbarium
- 3 online herbaria



## Genebank survey

- 5 Portuguese genebanks
- 10 online genebanks



# Data verification - example

## ACCESS Database

HERBARIA  
SPECIMENS

GERMPLASM  
ACCESSIONS

BIBLIOGRAPHY

PERSONAL  
COMMUNICATIONS



| Field Name | Data Type |  |
|------------|-----------|--|
| ID_reg     | Number    | Unique identification number of the record                   |
| ID_SP      | Text      | Unique identification number of the species                  |
| ACR        | Text      | Acronym of the institution                                   |
| Coll       | Text      | Particular collection  |
| Data_sourc | Text      | Source of data: H-herbarium, S-seed accession, R-bibliograph |
| Acc_Num    | Text      | Accession number   |
| Gen_Name   | Text      | Name of the genus  |
| Sp_Name    | Text      | Name of the species  |
| Sp_Authors | Text      | Authors of the species                                       |
| Infra_Cat  | Text      | Subspecies or variety  |
| Infra_Name | Text      | Name of the infra category                                   |
| Infra_Auth | Text      | Authors of the infra category                                |
| Reg        | Text      | Portuguese administrative region                             |
| Loc        | Text      | Location   |
| Level_inf  | Text      | Level of accuracy  |
| Long       | Number    | Longitude  |
| Lat        | Number    | Latitude   |
| Gauss_X    | Number    | Gauss - X coordinate   |
| Gauss_Y    | Number    | Gauss - Y coordinate   |
| UTM_X      | Number    | UTM - X coordinate   |
| UTM_Y      | Number    | UTM - Y coordinate   |
| Long_dir   | Text      | Longitude direction  |
| Lat_dir    | Text      | Latitude direction   |
| Alt        | Text      | Altitude in metres   |
| Date       | Text      | Collection date  |
| Fl         | Yes/No    | If the specimen has flowers                                  |
| Fr_imat    | Yes/No    | If the specimen has mature fruits                            |
| Fr_mat     | Yes/No    | If the specimen has mature fruits                            |
| No_fl_fr   | Yes/No    | If the specimen does not have either flowers or fruits       |
| Ecol       | Text      | Ecological notes   |
| Ass_Sp     | Text      | Associated species   |
| Col        | Text      | Name of the collectors                                       |
| Det        | Text      | Name of who identify the species                             |
| Obs        | Text      | Observations made by the collectors or identifiers           |
| Rev1       | Text      | Revision notes   |
| Rev2       | Text      | Revision notes   |
| Rev3       | Text      | Revision notes   |
| Rev4       | Text      | Revision notes   |
| Rev5       | Text      | Revision notes   |
| Photo      | Yes/No    | If there is photo  |
| Photo_link | Hyperlink | Link to the photo  |
| Source     | Text      | The source of information when not an herbarium specimen     |

# Data verification - example

## Type of information obtained

### HERBARIA SPECIMENS DATA

### GERMPLASM ACCESSIONS DATA

❖ Acronym

❖ Accession number

❖ Genus

❖ Species

❖ Infra

❖ Authors

❖ Location

❖ Latitude

❖ Longitude

❖ Altitude

❖ Habitat

❖ Collectors

❖ Identify by

❖ Ecological data (type of soil, parent rock,...)

# Data verification - example

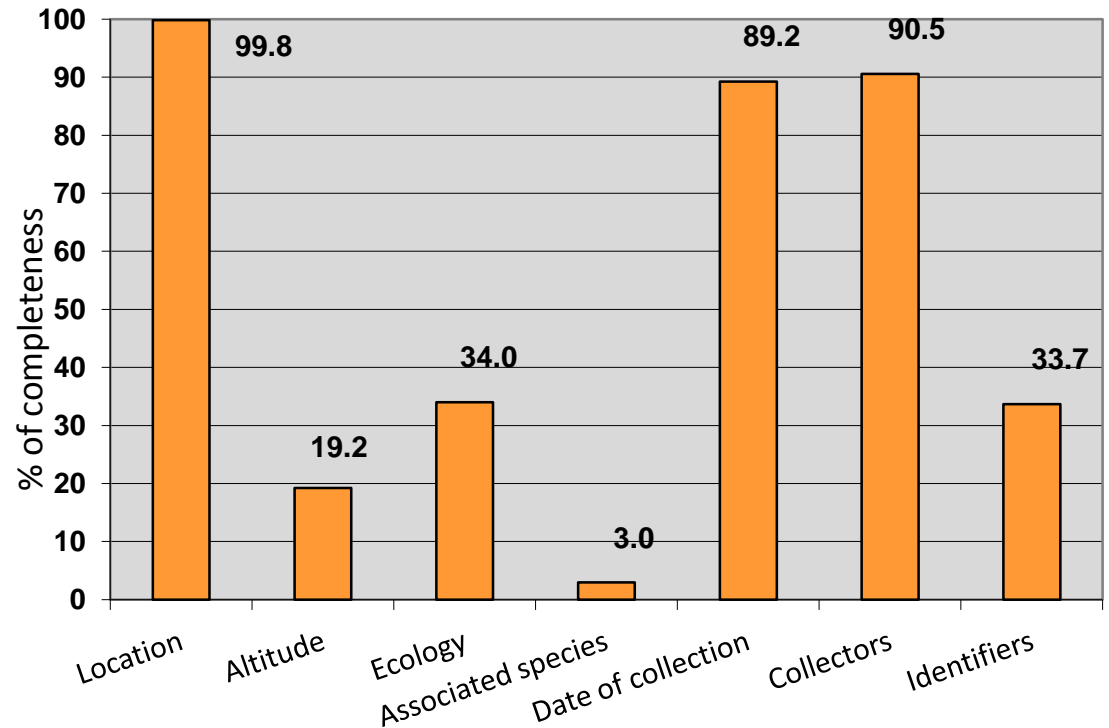
HERBARIA  
SPECIMENS

GERMPLASM  
ACCESSIONS

BIBLIOGRAPHY

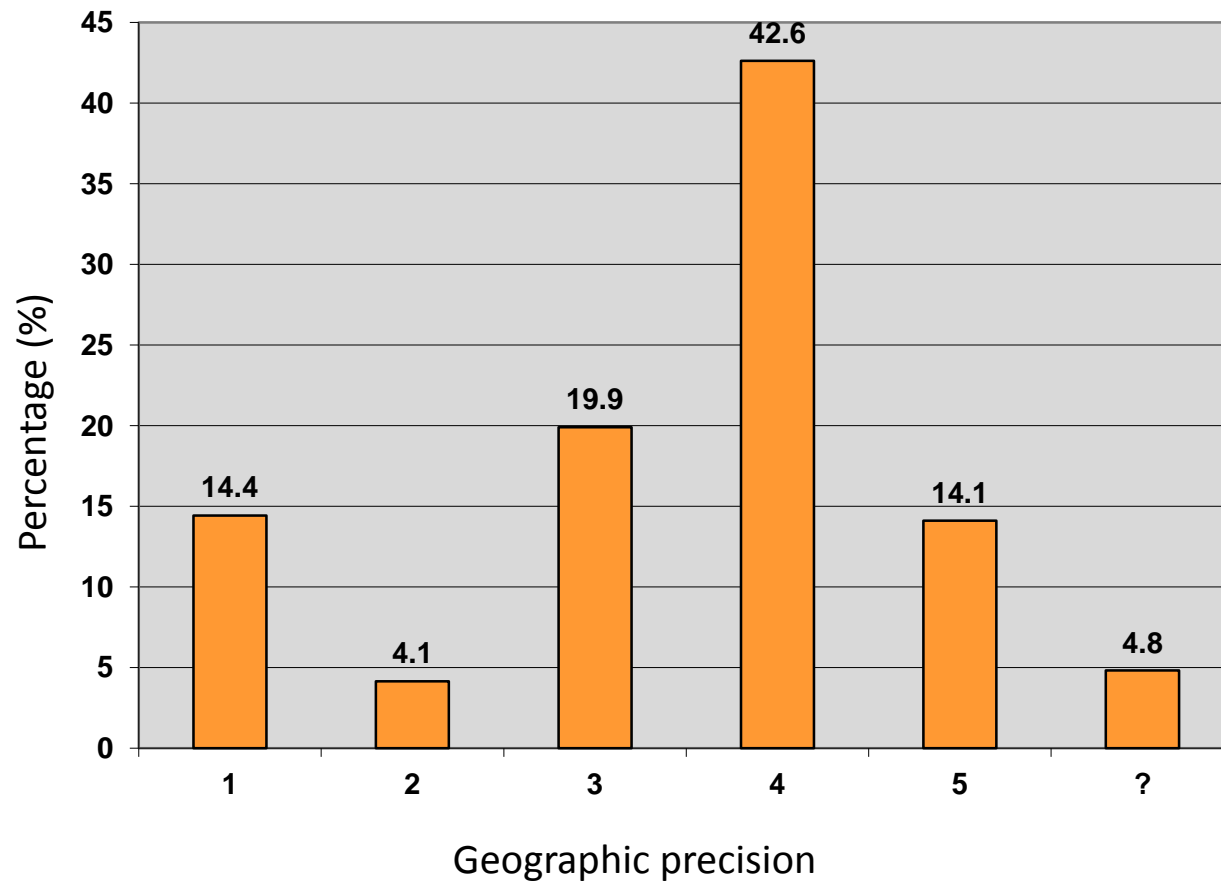
PERSONAL  
COMMUNICATIONS

Total 603

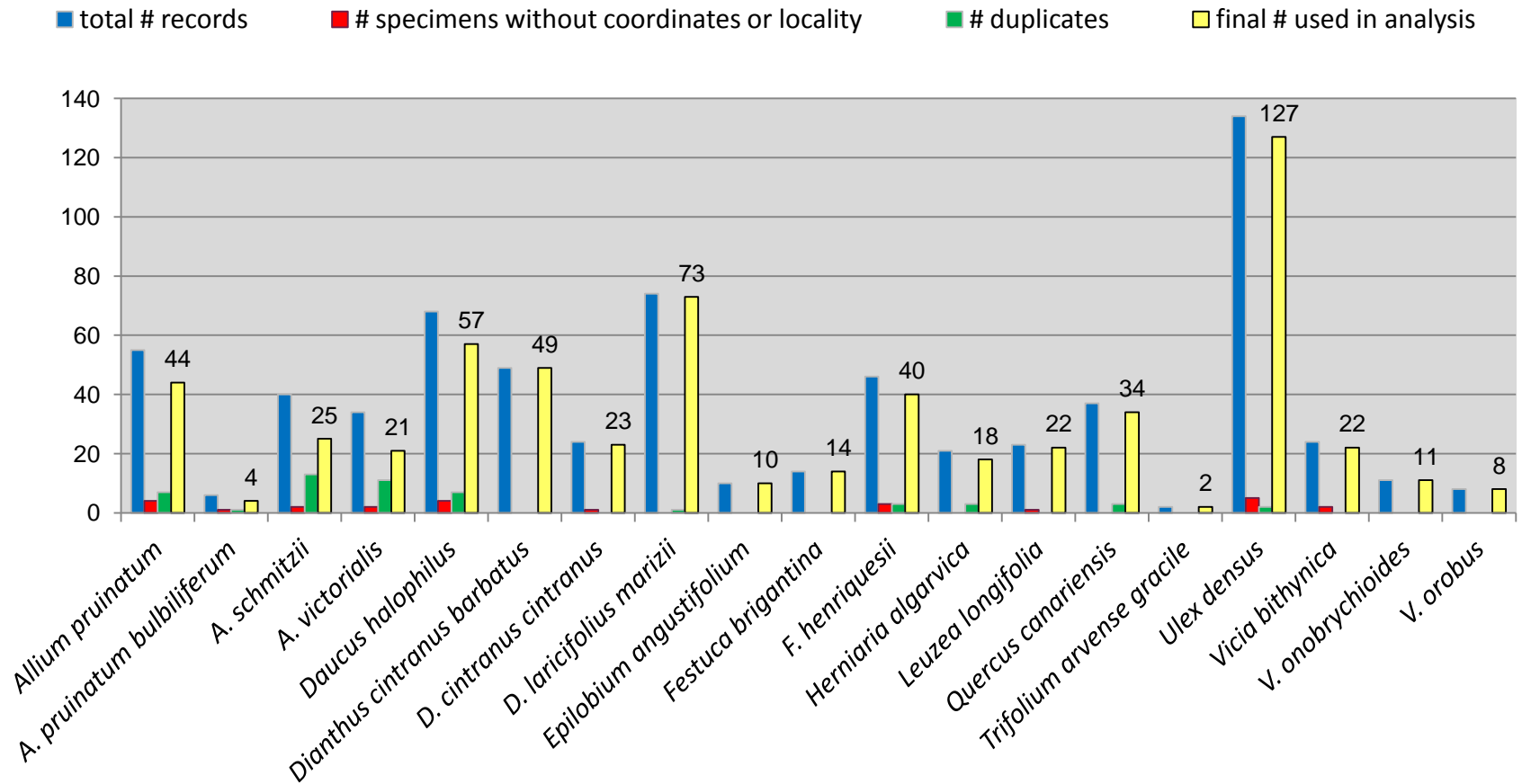




# Data verification - example



# Data verification - example



# GEOQUAL - CAPFITOGEN

CAPFITOGEN tools

www.capfitogen.net/en/

Google

## CAPFITOGEN Tools

NEWS PROGRAM TOOLS ACCESS WORKSHOPS CONTACT FORUM

10/20/2014 **CAPFITOGEN user's website: Opening!**  
Today, October 20, 2014 we officially open this website. After the final adjustments and consultations, we [...]

09/29/2014 **New site for CAPFITOGEN tools**  
It is a pleasure to present the new website for the CAPFITOGEN program and its tools Now, with a simple and [...]

09/29/2014 **TesTable, new tool of CAPFITOGEN family**  
We have fully developed the new CAPFITOGEN tool called 'TesTable', with which users can learn [...]

08/07/2014 **Welcome to the CAPFIT**

Search

OUR LATEST NEWS

CAPFITOGEN user's website: Opening!  
10/20/2014  
New site for CAPFITOGEN tools  
09/29/2014  
TesTable, new tool of CAPFITOGEN family  
09/29/2014  
Welcome to the CAPFITOGEN community  
08/07/2014

TOPICS

General  
Internet  
Sin categoría  
Tools

CAPFITOGEN EN ESPAÑOL

<http://www.capfitogen.net/>

# GEOQUAL - CAPFITOGEN

- Assign a quality assessment value to each georeferenced accession with locality description
- Accession data in the modified FAO-Biodiversity 2012 format
- SUITQUAL, LOCALQUAL, COORQUAL
- Parameters are summarized to obtain the parameter  
TOTALQUAL

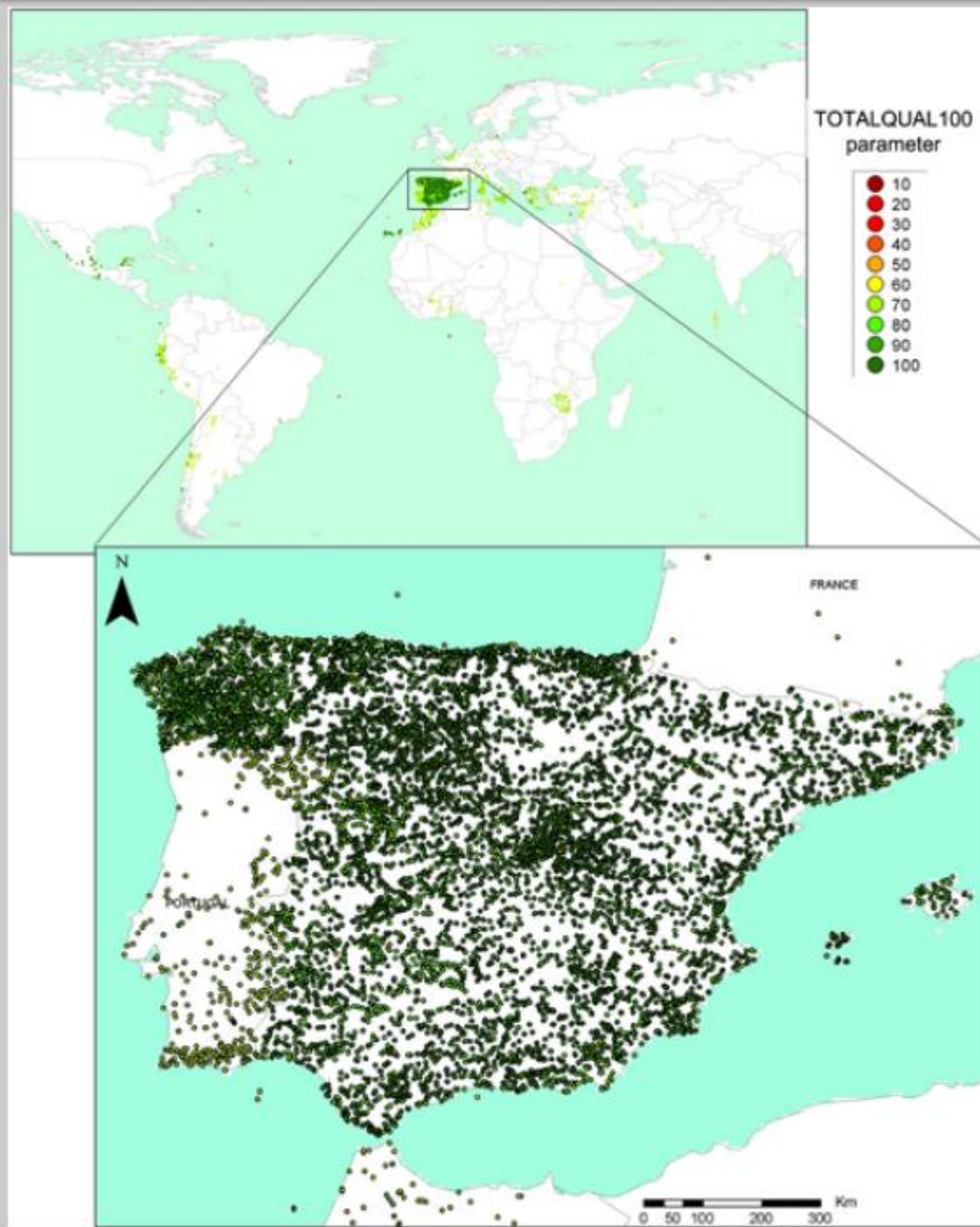
# GEOQUAL - CAPFITOGEN

- SUITQUAL: **suitability** to grow plants in the collecting sites, 0 - 20
- LOCALQUAL: compares **collecting site description** from the passport data and the site extracted from coordinates, 0 - 20
- COORQUAL: **intrinsic quality** value of the coordinates, 0 - 20
- TOTALQUAL = COORQUAL + SUITQUAL + LOCALQUAL (0 – 60)

$$\text{TOTALQUAL100} = (\text{TOTALQUAL} * 60) / 100$$



# GEOQUAL – CAPFITOGEN



➤ Visualize in Google Earth

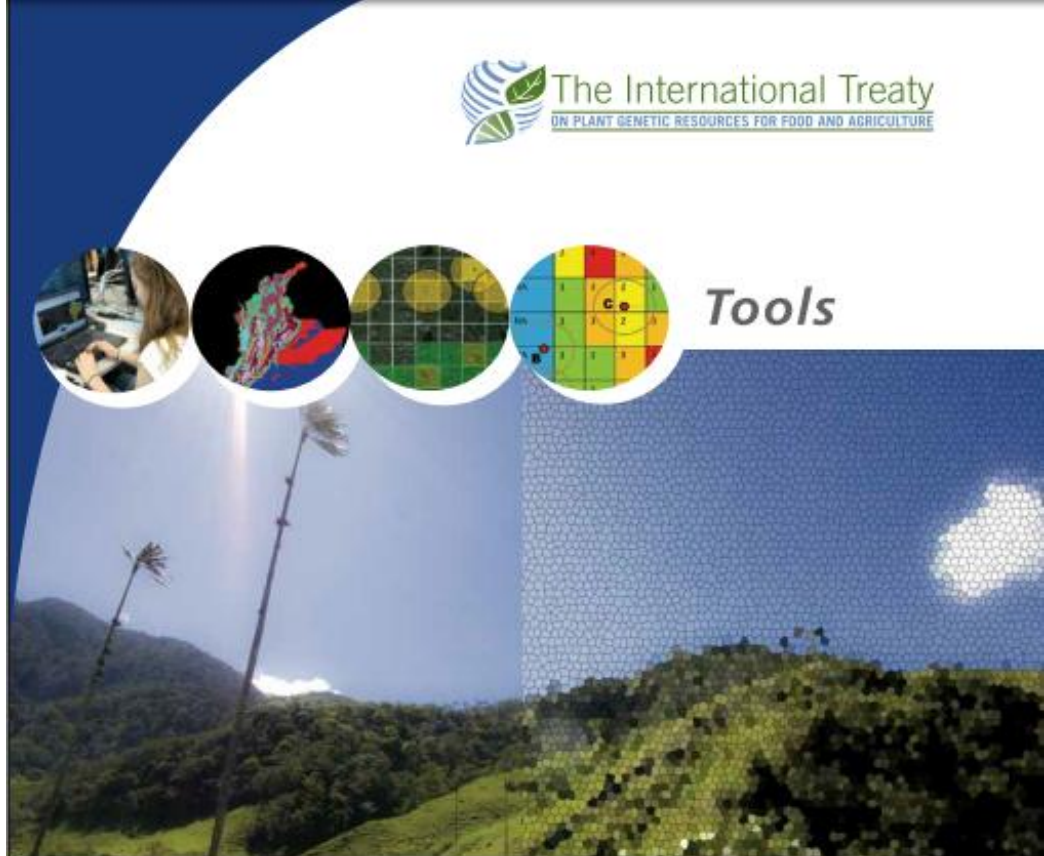


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# CAPFITOGEN



*Tools*



# CAPFITOGEN

Programme to Strengthen  
National Plant Genetic  
Resource Capacities  
in Latin America

Version 1.2

# International data sources

## PLANT SPECIES OCCURRENCE DATA:

- Global Biodiversity Information Facility: <http://www.gbif.org/>



- JSTOR GlobalPlants - images of herbaria vouchers:

<http://plants.jstor.org/> (need to be member to download info)

- Royal Botanic Garden Edinburgh – Herbarium Catalogue :



Royal  
Botanic Garden  
Edinburgh

<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>

- Kew Herbarium Catalogue: <http://apps.kew.org/herbcat/navigator.do>



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# International data sources

## PLANT SPECIES OCCURRENCE DATA:

- Natural History Museum, UK – botany collection database :

<http://www.nhm.ac.uk/research-curation/scientific-resources/collections/botanical-collections/botany-specimen-database/index.php>



- Virtual Australian Herbarium:

[http://avh.ala.org.au/search/#tab\\_advanceSearch](http://avh.ala.org.au/search/#tab_advanceSearch)



- United States Virtual Herbarium: <http://usvirtualherbarium.org>

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# International data sources

## PLANT SPECIES OCCURRENCE DATA:



- GENESYS – Gateway to Genetic Resources: global database of major *ex situ* gene bank holdings (<http://www.genesys-pgr.org/>) (no precise location data?)

- US Genetic Resources Information Network (GRIN) - database of USDA *ex situ* gene bank holdings: [http://www.ars-grin.gov/npgs/acc/acc\\_queries.html](http://www.ars-grin.gov/npgs/acc/acc_queries.html)



# International data sources

## ENVIRONMENTAL DATA:

- GCM Data Portal: <http://www.ccafs-climate.org/>
- Worldclim Global Climate layers - 1km resolution grids of climate and derived bioclimatic datasets: <http://www.worldclim.org/>
- Climate Change Forecasts (IPCC) - future climate projections: [http://www.ipcc-data.org/ddc\\_climscen.html](http://www.ipcc-data.org/ddc_climscen.html)
- Climatic Research Unit: <http://www.cru.uea.ac.uk/data/>
- DIVA-GIS: <http://www.diva-gis.org/Data>



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## ENVIRONMENTAL DATA:

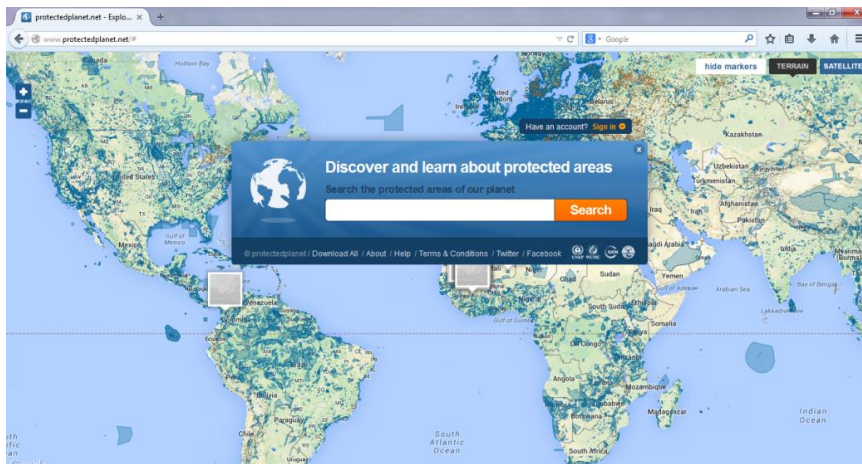
- Global Land Cover Characterization: <http://edc2.usgs.gov/glcc/glcc.php>
- Global Land Cover 2000:  
<http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.php>
- ISRIC World Soil Information: <http://www.isric.org/data/data-download>
- Harmonized World Soil Database (HWSD):  
<http://www.iiasa.ac.at/Research/LUC/External-World-soil-database/>



# International data sources

## ENVIRONMENTAL DATA:

- The CGIAR Consortium for Spatial Information (CGIAR-SCI) - STRM DEM 90m digital elevation dataset: <http://srtm.csi.cgiar.org/index.asp>
- UNEP WCMC World Database of Protected Areas: <http://www.protectedplanet.net/>



# Regional data sources

## PLANT OCCURRENCE DATA:

- ❑ African Plants Database: <http://www.ville-ge.ch/musinfo/bd/cjb/africa/recherche.php>
- ❑ SADC Plant Genetic Resource Centre: <http://www.sadc.int/sadc-secretariat/services-centres/spgrc/>



## ENVIRONMENTAL DATA:

- ❑ SADC Regional Climate Data Processing Centre: <http://www.sadc.int/sadc-secretariat/services-centres/regional-climate-data-processing-centre/>



SOUTHERN AFRICAN DEVELOPMENT COMMUNITY  
TOWARDS A COMMON FUTURE

# National data sources



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