

England Biodiversity Indicators 2021

This documents supports

12b. Plant genetic resources – Enrichment Index

**Technical background document:
Calculating the Enrichment Index**

For further information on the England Biodiversity Indicators visit
<https://www.gov.uk/government/statistics/england-biodiversity-indicators>

Technical Background Document:

Calculation Procedure for indicator 12b – the status of ex situ conservation of cultivated plants and their wild relatives in the UK.

An enrichment index has been developed by the United Nations Food and Agriculture Organisation (FAO) to describe the enhancement of *ex situ* plant germplasm collections (FAO 2010). This index can be applied to UK accessions, filtering data by relevant taxa and country of holding institute by the following steps. There has been no update to this indicator since the 2018 publication data where data were accessed on 7th June 2018.

Obtaining Data for Index

1. Access data from EURISCO, including current policy for viability and the following data fields: accession number, acquisition date, country of origin, collection date, genus, species, subspecies, holding institute, donor description, collection site, latitude and longitude.
This can be achieved through visiting the “Export EURISCO data” web page on the EURISCO web site (<http://eurisco.ipk-gatersleben.de/apex/f?p=103:1>).

Preparing the Data

1. *Filter data by taxa of interest.* The data downloaded from the EURISCO website first needs to be filtered by the taxa of interest. Download the datasheet for indicator C9b from the JNCC website (<http://jncc.defra.gov.uk/page-6573>) and navigate to the sheet named “Genus List”. Using Microsoft Excel’s ‘VLOOKUP’ function, filter the data so that only data pertaining to species on the “Genus List” sheet are shown.
2. *Identify gaps in acquisition date.* Where the donor name exists, the collection date can be used to fill gaps in the acquisition date field.
3. *Identify gaps in country of origin.* Collection site, latitude and longitude may be used to fill some gaps in the country of origin field.
4. Compare country of origin to collection site information to identify errors.
5. As a final check, all records must have a value for the following fields:
 - INSTCODE
 - ACCENUMB
 - ORIGCTY (Either all ISO codes, or all country names)
 - YEAR
 - TAXON

Any records not having all of these fields should be removed before continuing.

6. Two tables must then be created in Microsoft Access with the following names and information:

- **Table 1** = Collection table.
- **Table 2** = Country table.

Table 1: Information to be included in the COLLECTION table

Field Name	Data Type	Description	Example
ACCENUMB	Text	Unique identifier for the accessions	"BGE041338" "0924" "PI 67377"
ORIGCTY	Text	Name or code (for example country code ISO-3 letter) of the country where the sample was originally collected or derived. Country naming or coding must be consistently applied throughout the table and should be checked before undertaking the calculation.	"Russian Federation" "United States of America" "IND"
YEAR	Text	Year on which the accession entered the collection.	"1984" "2009"
TAXON	Text	Complete taxon name of the accession. When available it should include any additional taxonomic identifier under the species ranking, for example subspecies or variety. Consistency in taxonomic nomenclature should be checked throughout the table in order to avoid different formatting for the same taxon.	"Avena sativa" "Avena sativa var. mutica"

Information from EURISCO download

Field name in COLLECTION	Table Field name in Multi-Crop Passport Descriptors (MCPD)
ACCENUMB	ACCENUMB (Accession number)
ORIGCTY	ORIGCTY (Country of origin)
YEAR	First 4 characters of ACQDATE (Acquisition date)
TAXON	GENUS + " " + SPECIES + " " + SUBTAXA

Final structure of COLLECTION table in Access

ACCENUMB	ORIGCTY	YEAR	TAXON
Data...	Data...	Data...	Data...

Table 2: Information to be included in the COUNTRY table

Field Name	Data Type	Description	Examples
CTY_NAME	Text	Name or code (for example country code ISO-3 letter) of the country.	“United States of America” “USA”
CTY_AREA	Number	Total area of the country (ha or km ²).	1,492,584
CULTIV_AREA	Number	Cultivated area (ha or km ²) of the country or administrative area. FAOSTAT2 can be used as a source of information. Units (hectares, km²) used must be the same as used in CTY_AREA. (table in existing Access database used in 2018)	641,653

Final structure of COUNTRY table in Access

CTY_NAME	CULTIV_AREA	CTY_AREA
Data...	Data...	Data...

Calculating the Index

1. Add data to the MS-Access application produced by the FAO, which can be downloaded from: <http://apps3.fao.org/wiews/docs/EI.zip> (note this no longer exists, so the existing access database was used in 2018). To do this you may have to delete the existing tables and import the excel tables that you created earlier.
2. With the tables inserted: the quality control macros should be performed on both the COLLECTION and the COUNTRY tables:

A macro called “D_TAX” helps to check the distinct TAXA recorded under the COLLECTION table and to avoid unwanted duplications. After running the macro,

open the DIST_TAXA table to revise the list of distinct taxa extracted from the COLLECTION table.

A macro called “CTY_CHECK_MACRO” is available to check if all occurrences of ORIGCTY in the COLLECTION table exist in the COUNTRY table, which is a prerequisite for the correct calculation of the EI. The result of the macro is a list of ORIGCTY occurrences (called missing_ORIGCTY table), which do not have a correspondent record in the COUNTRY table. Once missing occurrences are identified, the user can either add them to the COUNTRY table or correct them in the COLLECTION table. The user can proceed to the following step if the missing_ORIGCTY table is empty after running the macro “CTY_CHECK_MACRO”.

3. Once the COLLECTION and COUNTRY tables are prepared and checked in line with the data structure and controls as indicated in steps 1 and 2 above, the application is ready to calculate the Enrichment Index. To do so, the macro “ENRICHMENT_INDEX_MACRO” should be run. As a result a table called “ENRICHMENT_INDEX” with the yearly calculation of the EI will be created. An example is below.

Year	Enrichment Index
1979	3.55
1980	4.46
.....	1.16
2001	1256.34
2002	1500.15

4. Each time the macro is run, the “ENRICHMENT_TABLE” table is re-calculated and all records min the table are overwritten. To keep the results obtained it will be necessary to export the table to another application or alternatively to rename the table.

Graphical Representations

Plotting the Enrichment Index

1. After exporting the results into excel, graphical representations can be created, using the values directly, or the cumulative enrichment index can be calculated and plotted.

Plotting the Number of Accessions by Institute

1. To plot the number of accessions by institute take the database which you prepared for the enrichment index, which is restricted to the taxa of interest and only complete records.
2. Copy the columns headed INSTCODE, and YEAR into a new spreadsheet.
3. Create a pivot table using the two columns as the source data.
4. Choose both fields to add to the report.
5. To the “Column Labels” box insert the “INSTCODE” variable.

6. To the “Row Labels” box insert the “YEAR” variable.
7. To the “Σ Values” box insert the “Count of INSTCODE” by inserting the “INSTCODE” variable.
8. Create a bar chart using year as the x-variable and add each institutions accessions as a separate series of the y-variable to create the final plot.
9. Create graphs of accessions per year.

Further Background Technical Information

Associated data standards

The FAO/International Plant Genetic Resources Institute (IPGRI) Multi Crop Passport Descriptors (MCPD) (Alercia *et al.* 2001) are used by EURISCO, together with a further six descriptors. The first of these additional descriptors identifies the National Inventory and the final five allow relevant information to be incorporated into EURISCO.

Standards for seed storage and the exchange and distribution of seeds from active collections are described in the FAO Genebank Standards, which are due to be updated with the Draft Genebank Standards for Plant Genetic Resources for Food and Agriculture, along with standards for *in vitro* culture and cryopreservation (FAO 2013).

Security of future data collection

In 2000, the European Union approved funding through the 5th Framework Programme Project for the European Plant Genetic Resources Information Infra-Structure (EPGRIS), for the development of National Inventories of plant genetic resources and for the creation of EURISCO, a searchable catalogue of *ex situ* collections in Europe. Funding has subsequently been made available from the European Cooperative Programme for Plant Genetic Resources (ECPGR), Biodiversity International and in-kind contributions from the National Focal Points (EURISCO 2013). Given that there is a mandate for National Inventories and a funding system is in place for EURISCO, future data collection should be relatively secure.

National Inventories are implemented and maintained by individual European Countries as a contribution to the implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and other international mechanisms such as the Food and Agriculture Organization of the United Nations (FAO) Global Plan of Action, the Clearing House Mechanism (CHM) of the Convention on Biological Diversity (CBD) and the Global Biodiversity Information Facility (GBIF) (EURISCO 2013).

A survey by the UNEP World Conservation Monitoring Centre in 2013 of collections of UK genetic resources, identified that all collections included in EURISCO were either secure, or moderately secure.

Wild relatives of cultivated plants are those falling within taxon groups 1 to 3 as defined in the taxon group concept (Maxted *et al.* 2006). In this indicator a slightly broader scope based on genus of the taxa is used, as within the taxon group concept, groups 1

to 3 goes to subgenus (which would add to the complexity of filtering the results downloaded from EURISCO).

References

- Alercia, A., Diulgheroff, S. & Metz, T. (2001) FAO/IPGRI Multi-Crop Passport Descriptors. Food and Agriculture Organization of the United Nations (FAO), Rome (Italy); International Plant Genetic Resources Institute, (IPGRI), Rome (Italy). [Online]. Available at: http://www.bioversityinternational.org/uploads/tx_news/FAO_IPGRI_Multi-Crop_Passport_Descriptors_MCPD_124_07.pdf (PDF, 178kb).
- EURISCO. (2012) About EURISCO. [Online]. Available at: [http://eurisco.ipk-gatersleben.de/apex/f?p=103:2:0:::.](http://eurisco.ipk-gatersleben.de/apex/f?p=103:2:0:::)
- EURISCO. (2013) FAQs. What is a NI? [Online]. Available at: [http://eurisco.ipk-gatersleben.de/apex/f?p=103:8:0:::NO:::.](http://eurisco.ipk-gatersleben.de/apex/f?p=103:8:0:::NO:::)
- FAO. (2010) Enrichment Index: An indicator of enhancement for *ex situ* plant germplasm collections. FAO Plant Production and Protection Division. Unpublished report. 5 pages.
- FAO. (2010) Calculation of the *ex situ* collections' Enrichment Index user manual. FAO Plant Production and Protection Division. Unpublished report. 4 pages.
- FAO. (2013) Draft genebank standards for plant genetic resources for food and agriculture. Fourteenth regular session of the Commission on Genetic Resources for Food and Agriculture. 15 to 19 April 2013, Rome, Italy. [Online]. Available at: <http://www.fao.org/docrep/meeting/027/mf804e.pdf> (PDF, 931kb).

12b. Plant genetic resources: Enrichment Index

UK Biodiversity Indicators 2018 – Enrichment Index run 2018-06-07

	Analysis	Comment
Download GBR data	833,114 accessions downloaded	EURISCO data dump downloaded 2018-06-07 . [1,973,596 accessions]
Filter by taxa of interest	131,902 accessions filtered	2,169 genera
Identify gaps in acquisition dates	700 accessions added	There were 700 donor names for 1361 accessions with a collection date but not no acquisition date. Note the change in column name from DONORDESCR to DONORNAME
Identify gaps in country of origin	30 accessions added	
Check country of origin to collection site	7 accessions removed	
Remove accessions with missing data	97,687 accessions remaining [74%]	34,208 accessions removed [26%]
Check taxon names		26,819 distinct taxon names
Check years valid	1 accession removed	
Create country table		Country and cultivated area stats for 150 countries taken from supplied access database from previous analysis
Remove countries with missing area stats	41 countries with missing stats from 2260 accessions	

Annex 2: Further Background Technical Information

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- EURISCO. (2012) About EURISCO. [Online]. Available at: [http://eurisco.ipk-gatersleben.de/apex/f?p=103:2:0:::.](http://eurisco.ipk-gatersleben.de/apex/f?p=103:2:0:::)
- EURISCO. (2013) FAQs. What is a NI? [Online]. Available at: [http://eurisco.ipk-gatersleben.de/apex/f?p=103:8:0::NO::.](http://eurisco.ipk-gatersleben.de/apex/f?p=103:8:0::NO::)

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FAO. (2010) Enrichment Index: An indicator of enhancement for *ex situ* plant germplasm collections. FAO Plant Production and Protection Division. Unpublished report. 5 pages.

FAO. (2010) Calculation of the *ex situ* collections' Enrichment Index user manual. FAO Plant Production and Protection Division. Unpublished report. 4 pages.

FAO. (2013) Draft genebank standards for plant genetic resources for food and agriculture. Fourteenth regular session of the Commission on Genetic Resources for Food and Agriculture. 15 to 19 April 2013, Rome, Italy. [Online]. Available at: <http://www.fao.org/docrep/meeting/027/mf804e.pdf> (PDF, 931kb).