

Project:	CWR in EURISCO	Date:	2024-01-17
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This report describes the activities carried out by IPK Gatersleben between 1st October 2022 and 31st December 2023 in the frame of the project “CWR in EURISCO” (LoA N° L22ROM153).

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1 Background and aims

The European Search Catalogue for Plant Genetic Resources (EURISCO) documents more than two million accessions of cultivated plants and their wild relatives, which are preserved under *ex situ* conditions in more than 400 collections throughout Europe and neighbouring countries. To achieve this, EURISCO is based on a network of National Inventories from 43 countries through which these data flow together. EURISCO provides information on the great genetic diversity preserved by the cooperating institutions. In this way, the system makes an important contribution to the conservation of global agrobiodiversity.

The genetic resources of crop wild relatives (CWR) native to Europe are related to many socio-economically important crops grown in the region and in other parts of the world, and contain a large pool of evolving genetic diversity of potential value for crop improvement. New challenges posed by climate change increase the need to explore potential sources of new diversity. In addition, innovative molecular technologies make it easier to study wild gene pools to find useful alleles.

The need to conserve and document CWR has been recognised, inter alia, in the Convention on Biological Diversity (CBD), the Second Global Plan of Action (GPA) on Plant Genetic Resources for Food and Agriculture and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

Since 2014, the ECPGR Working Group on Documentation and Information has been discussing the issue of *in situ* conservation data and recommending its inclusion in the EURISCO catalogue. The recommendation to use EURISCO to document data on the most suitable wild populations of CWR was also made in the “ECPGR Concept for *in situ* conservation of crop wild relatives in Europe”, a document endorsed by the ECPGR Steering Committee in March 2015. The “European Strategy for conservation and sustainable use of plant genetic resources” (PGR Strategy), submitted to the ECPGR Steering Committee for endorsement in October 2021, recognises that many national programmes in the European region have a growing evidence base on the diversity, conservation and use of CWR.

The issue of *in situ* material was also discussed at the EURISCO Advisory Committee meeting in July 2021 and it was decided to develop a plan for the extension of EURISCO to include *in situ* data.

Against this background, the German Federal Agency for Agriculture and Food approved a project to promote the definition of the scope of the type of *in situ* CWR data that would benefit from inclusion in EURISCO. This project aims to expand the EURISCO catalogue and prepare it to include and make publicly available the *in situ* CWR data provided by European countries. The provision of data from these pilot countries will complement the new EURISCO extensions and serve as an example to all other countries.

2 Approach

In order to extend EURISCO for *in situ* CWR data, the following tasks had to be completed:

- Compile a EURISCO-*in situ* CWR data standard;
- Implement a mechanism for providers of *in situ* CWR data to upload it to a staging area;
- Implement integrity checking mechanisms to be applied to the uploaded data;
- Modify/extend the EURISCO database schema to include *in situ* CWR data;
- Implement an update mechanism for integrating the *in situ* CWR data into the actual EURISCO database schema;
- Implement an intranet interface for *in situ* CWR-NFPs and embed the upload/check/update mechanisms;
- Extend the public EURISCO application for *in situ* CWR data

The flow of *in situ* CWR data between the *in situ* National Inventories and EURISCO is shown in Figure 1.

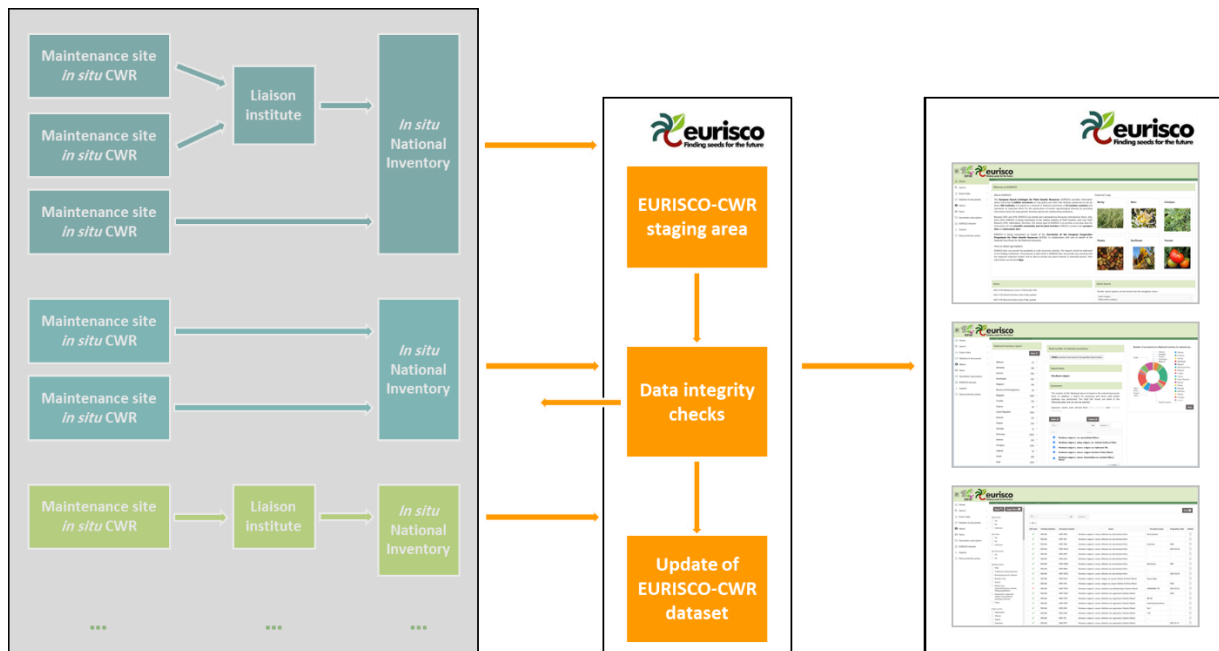


Figure 1: Flow of *in situ* CWR data between National Inventories and EURISCO.

3 Results

Within the project “Extension of EURISCO for Crop Wild Relatives (CWR) *in situ* data and preparation of pilot countries’ data sets”, funded by the German Federal Ministry of Food and Agriculture and coordinated by the ECPGR Secretariat, the adaptation of EURISCO for *in situ* CWR data started in October 2022 and was continued in 2023. In addition to extensions to the existing table structure of the database schema, 7 additional tables were created. Furthermore, a total of 3 PL/SQL packages containing 71 background programmes and 24 front-end application pages were created to achieve the objectives of uploading, validating and updating of EURISCO with *in situ* CWR data (Table 1). In addition, there are various extensions to the public EURISCO web interface to enable the new data to be searched and displayed.

Table 1: Summary of implemented PL/SQL packages.

Total	Package	Type
5	EURISCO_CWR_IMPORT_CHECKS	FUNCTION
28	EURISCO_CWR_IMPORT_CHECKS	PROCEDURE
23	EURISCO_CWR_UPDATE	FUNCTION
8	EURISCO_CWR_UPDATE	PROCEDURE
5	EURISCO_EXCEL_CWR_IMPORT	FUNCTION
2	EURISCO_EXCEL_CWR_IMPORT	PROCEDURE

A how-to document was created to support the data providers and is available in the EURISCO *in situ* CWR intranet.

3.1 EURISCO-in situ CWR data standard

Based on the white paper “Principles for the Inclusion of CWR Data in EURISCO” (van Hintum & Iriondo 2022), a data exchange standard was defined in 2022. This document includes 28 passport descriptors and is closely aligned with the MCPD standard for *ex situ* passport data in order to reuse the existing infrastructure as much as possible.

Following on from this, an Excel template was also created that can be used by data providers to submit *in situ* CWR data to EURISCO.

Based on feedback from *in situ* CWR data providers in 2023, extensions were made to the data standard. This affected the descriptors SITEPROT and CONSACTION, which now allow multiple values.

3.2 Data upload mechanism

A mechanism to support the upload process was implemented and tested. As the group of data providers of *in situ* CWR data is not necessarily the same as that of *ex situ* passport data, a separate web interface for uploading *in situ* CWR data is used for this purpose. The user interface is purely web-based; third-party software and special firewall settings are therefore not required. However, both interfaces use the same design and are as intuitive as possible (Figure 2).

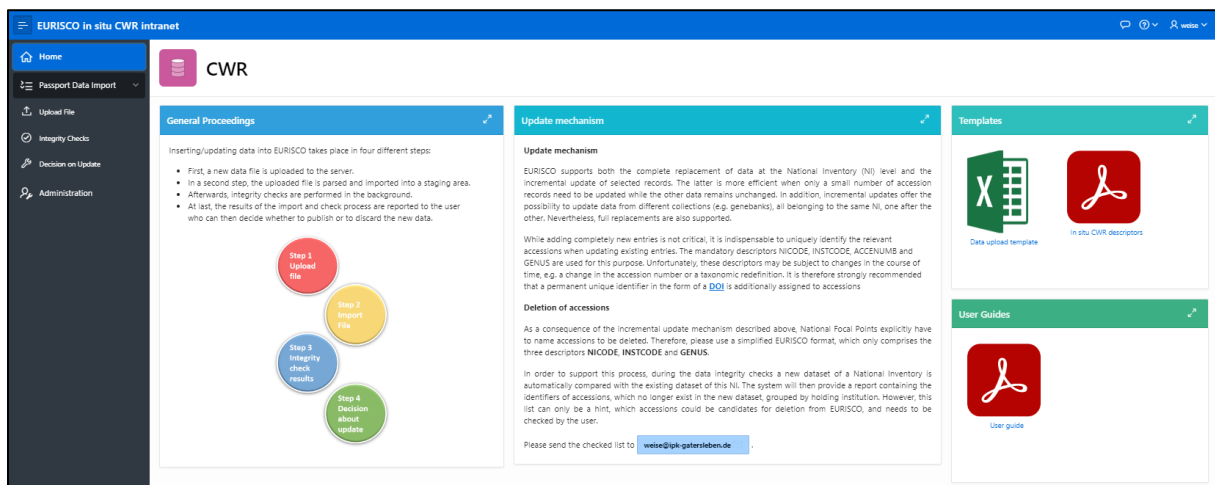


Figure 2: Screenshot of the web interface for uploading *in situ* CWR data to EURISCO.

All background processes are implemented in a PL/SQL package with seven procedures and functions. All the data provided is not uploaded directly into the actual EURISCO database schema, but in the first step into a staging area.

3.3 Data integrity checks

After uploading data to the staging area, it must be checked for compliance with the *in situ* CWR data standard. The integrity checks required for this were largely implemented with PL/SQL. All checks are organised in a package comprising 33 procedures and functions.

3.4 Modification/extension of the EURISCO database schema

The aforementioned staging area was created for the temporary management of uploaded data during the required data integrity checks.

All necessary adaptations and extensions of the actual EURISCO database schema have been carried out to handle *in situ* CWR data. First and foremost, this concerns extensions to the central accession table and the creation of structures for the management of occurrence site, site protection and conservation action information.

In total, 7 additional tables were created in addition to extensions to the existing table structure of the database schema.

3.5 Data integration mechanism

To ensure the consistent integration of the *in situ* CWR data uploaded to the staging area and checked there into the actual EURISCO database schema, the necessary functionality was implemented. This was also done using a PL/SQL package comprising 31 procedures and functions.

3.6 Extension of the public EURISCO web application

In order to make the data of the first *in situ* CWR populations imported into EURISCO searchable, work has begun on expanding the public web application. It allows to search for all populations of an *in situ* National Inventory, for specific taxonomic terms or a combination thereof (Figure 3). Additional filters can be applied in a subsequent step using a faceted search.

In addition, all previous features that search the entire EURISCO dataset, which includes the *in situ* CWR populations, can also be used. For this purpose, an additional filter has been implemented for each of the existing reports, which allows the number of hits to be limited to *in situ* material (Figure 4). The accession details pages in EURISCO have also been extended to display the additional information (Figure 5).

The screenshot shows the EURISCO website interface. The header includes the ECP/GR logo and the EURISCO logo with the tagline "Finding seeds for the future". The navigation menu on the left includes: Home, Passport data, Standard searches (ex situ), In situ CWR search (highlighted), Index of common names, Index of taxa, DOI search, Search on map, C&E data, Export data, Statistics & documents, About, and News. The main content area is titled "Home \ In situ CWR search \". It contains an introductory text: "In the frame of the project 'Extension of EURISCO for Crop Wild Relatives (CWR) in situ data and preparation of pilot countries' data sets', the EURISCO infrastructure has been extended for the management of in situ CWR data. Some of the pilot countries involved in the project have already provided production data on in situ CWR populations for integration into EURISCO." Below this, it states: "This search mask allows simple filtering. More comprehensive search functionalities for in situ CWR data will be available in 2024." The search mask includes three dropdown menus: National Inventory (set to SPAIN), Genus (set to ALLIUM), and Species (set to OLERACEUM). There are "Search" and "Reset" buttons at the bottom of the search mask.

Figure 3: Search mask to filter for *in situ* CWR populations.

The screenshot shows the EURISCO search results table. The table has columns: C&E data, Holding institute, Accession number, Taxon, Accession name, Acquisition date, and Details. The table is filtered to show only *in situ* CWR material. The filters on the left are: ASGE status (Yes, No, Unknown), MLS status (Yes, No, Unknown), C&E data exists? (Yes, No), In situ CWR accs.? (Yes, No), and Holding institute (Comunidad de Madrid, Universidad Politécnica de Madrid, Escuela Técnica Superior de Ingeniería Agronómica, Alimentaria y de Biosistemas - Banco de Germoplasma César Gómez Campo, Madrid, Spain, Generalidad Valenciana). The table shows 13 results, all with "DUMMY" as the holding institute and "X" in the C&E data column. The results are as follows:

C&E data	Holding institute	Accession number	Taxon	Accession name	Acquisition date	Details
X	DUMMY	Hypericum perforatum_9	Hypericum perforatum L.	-	2019	Details
X	DUMMY	Aegilops geniculata_1	Aegilops geniculata Roth	-	2019	Details
X	DUMMY	Dianthus armeria_2	Dianthus armeria L.	-	2021	Details
X	DUMMY	Ornithopus compressus_1	Ornithopus compressus L.	-	2020	Details
X	DUMMY	Borago officinalis_3	Borago officinalis L.	-	2020	Details
X	DUMMY	Daucus carota_5	Daucus carota L.	-	2019	Details
X	DUMMY	Daucus carota_6	Daucus carota L.	-	2021	Details
X	DUMMY	Linum bienne_5	Linum bienne Miller	-	2019	Details
X	DUMMY	Papaver rhoeas_9	Papaver rhoeas L.	-	2019	Details
X	DUMMY	Phleum pratense_2	Phleum pratense L.	-	2021	Details
X	DUMMY	Lotus corniculatus_1	Lotus corniculatus L.	-	2020	Details
X	DUMMY	Thymus mastichina_6	Thymus mastichina (L.) L.	-	2021	Details
X	DUMMY	Lavandula pedunculata_1	Lavandula pedunculata (MILL) Cav.	-	2020	Details

Figure 4: Filter limiting search results to *in situ* CWR material only.

Accession details Back

National Inventory code	ESP
National Inventory name	Spain
Institute name	Propiedad privada
Accession number	Allium oleraceum_2
Country of origin	ESP (Spain)
MLS status	part of the MLS
AEGIS status	unknown
Genus	Allium
Species	oleraceum
Species authority	L.
Biological status	100 (Wild)
Acquisition date	2021
Germplasm storage	60 (In situ wild population)
Latitude	410402N
Longitude	0033130W
Coordinate uncertainty [m]	10
Elevation [m]	1199
Collecting site	Granja Prados Montes
Accession URL	https://www.sierradelrincon.org/wp-content/uploads/2022/05/04GPM_GranjaPrados-Montes_PlanGestionRG.pdf
In situ CWR accession	yes
Occurrence site	Farm or cultivated area
Site protection	other effective conservation measures (OECM)
Conservation action	Monitoring and Planning, Education and Legislation, Species Management, Land/Water Protection and Management
Liaison institute name	Área de Promoción y Educación Ambiental, Comunidad de Madrid

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Last update of accession record: **2023-12-14**

Figure 5: Accession details page showing data on an *in situ* CWR population.

3.7 Tests and going live

Some countries of the pilot group of data providers involved in the project provided real data in order to test the overall system of the *in situ* CWR extension under real conditions. Any errors that occurred

were fixed. Once the tests in the development environment were completed, the *in situ* CWR extension was rolled out in the production system.

The synchronisation process was then extended to provide the EURISCO data for the public web application.

At the end of 2023, the first production *in situ* CWR data from four countries was imported into EURISCO and made publicly available. Data on 20 populations has been imported for Bulgaria, 66 for Germany, 1,912 for the Netherlands and 27 for Spain. At the beginning of 2024, data on 391 populations from Cyprus and 12 from Italy were additionally imported.

4 Outlook

Further search and visualisation options for *in situ* CWR populations will be implemented as part of the regular further development of EURISCO. In addition, the intranet environment will be adapted and further developed as required. To this end, user feedback and change requests will be evaluated with regard to their feasibility and corresponding development steps will be planned.