

EURISCO progress report

(April 2014 – April 2018)

ECPGR Phase IX

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1 Introduction

The *European Search Catalogue for Plant Genetic Resources* (EURISCO; <http://eurisco.ecpgr.org>) provides information about more than 1.9 million accessions of crop plants and their wild relatives, preserved *ex situ* by almost 400 institutes in Europe and beyond. EURISCO, which is being maintained on behalf of the European Cooperative Programme for Plant Genetic Resources (ECPGR), is based on a network of National Inventories of 43 member countries. It represents an important effort for the preservation of the world's agrobiological diversity by providing information about the large genetic diversity kept by the collaborating institutions.

EURISCO was initially developed within the EU-funded EPGRIS (European Plant Genetic Resources Information Infra-Structure) project, and afterwards, it was operated and further developed by Bioversity International, Rome, from 2003 until 2014. In the frame of a tender for the hosting of EURISCO launched by ECPGR, the bid offered by the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Gatersleben, Germany, was successful. Since April 2014, IPK thus became responsible for the operation and development of EURISCO. After a comprehensive re-engineering, EURISCO became fully operational from the IPK website by September 2014.

EURISCO is being continuously developed at IPK, based on the requirements and suggestions expressed by the European Plant Genetic Resources community, and with the aim of establishing EURISCO as a central repository for information on PGRFA at the European level, and of increasing its attractiveness for modern plant research and breeding.

2 New hosting of EURISCO

2.1 PREPARATION OF TRANSFER

In October 2013, a work meeting took place at Bioversity International, Maccaresse, Italy. Representatives of the previous host, Bioversity International, and the future host, IPK Gatersleben, Germany, discussed a timetable for the transfer of EURISCO. Both frontend and backend of the existing system were briefly described and demonstrated. Existing shortcomings and emerging problems with regard to the transfer were discussed.

2.2 SYSTEM RE-ENGINEERING AND DATA MIGRATION

Due to technical and organisational issues, the existing solutions could not be transferred to the new host as is. Instead, a re-engineering from scratch was performed; this regarded both the public EURISCO application (search interface and database infrastructure behind) and the EURISCO intranet (module for uploading National Inventory datasets by the National Focal Points). Thus, it was necessary to find a balance between developments which are visible (search interface) and those which completely took place in the background. For this reason, there were certain functional limitations of the new system at the beginning.

2.2.1 Frontend re-engineering (public EURISCO application)

The frontend comprises both the public search interface and the database infrastructure behind.

Due to insufficient documentation of the existing frontend, as a first step the previous search interface was analysed and its functionality was documented at IPK. This document formed the basis for the development of the new search interface.

Based on the MySQL database received from Bioversity International, the database schema supporting the previous frontend was analysed and successively re-engineered using an Oracle DBMS. The new database schema comprised 29 tables, 18 materialised (snapshot) views and 421 indices for performance improvement, and four PL/SQL packages for data download, newsletter etc.

In order to transfer the previous EURISCO dataset from MySQL to the new Oracle database schema, a migration path needed to be developed.

The new search interface was developed using the Oracle Application Express (APEX) technology. The functionality of the search interface was based on the previous application.

2.2.2 Backend re-engineering (EURISCO intranet)

The EURISCO backend comprises (i) a web application enabling the National Focal Points (NFPs) to update their National Inventory (NI) datasets, (ii) the necessary database structure, and (iii) all functions and procedures necessary to upload, check and update the datasets.

As in the case of the public EURISCO application, the EURISCO intranet also had to be re-engineered from scratch. Based on a textual description of the necessary steps, a new pipeline for updating the National Inventory datasets was developed.

During the re-engineering, a four-step procedure for inserting/updating data in EURISCO was established (Fig. 1):

- First, a new data file was uploaded to the server.
- In a second step, the uploaded file was parsed and imported into a staging area.
- Afterwards, comprehensive integrity checks were performed.
- Finally, the results of the import and checking process were reported to the user who could then decide whether to publish or to discard the new data (in case they need to be reworked).

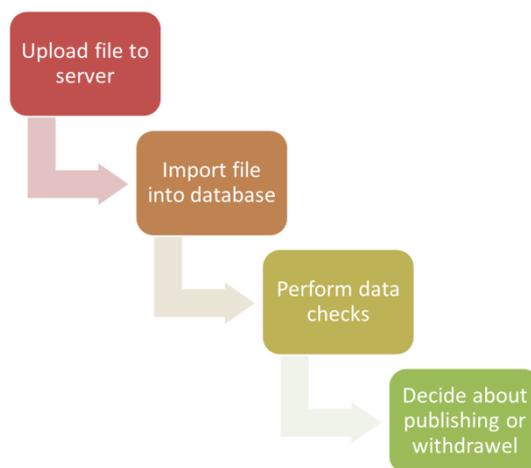


Fig. 1: Procedure of inserting/updating data in the EURISCO intranet after the re-engineering in 2014.

Once the user had decided to publish the new data (after successfully performing integrity checks), the dataset was synchronised from the backend database schema to the frontend database schema (Fig. 2).

During the re-engineering of the EURISCO backend, the most important procedures for performing integrity checks and for updating were developed. However, as it used to be in the previous system, the integrity of taxonomic names was not yet checked. The development of checking procedures for the taxonomic nomenclature was planned for the future (see project “EURISCO taxonomy” below).

The EURISCO intranet web application was developed using the Oracle Application Express technology too; for the data management, an Oracle DBMS was used. The new database schema comprised 28 tables, 55 triggers, two views, 287 indices, and seven PL/SQL packages with 77 procedures for importing, checking and updating new datasets.

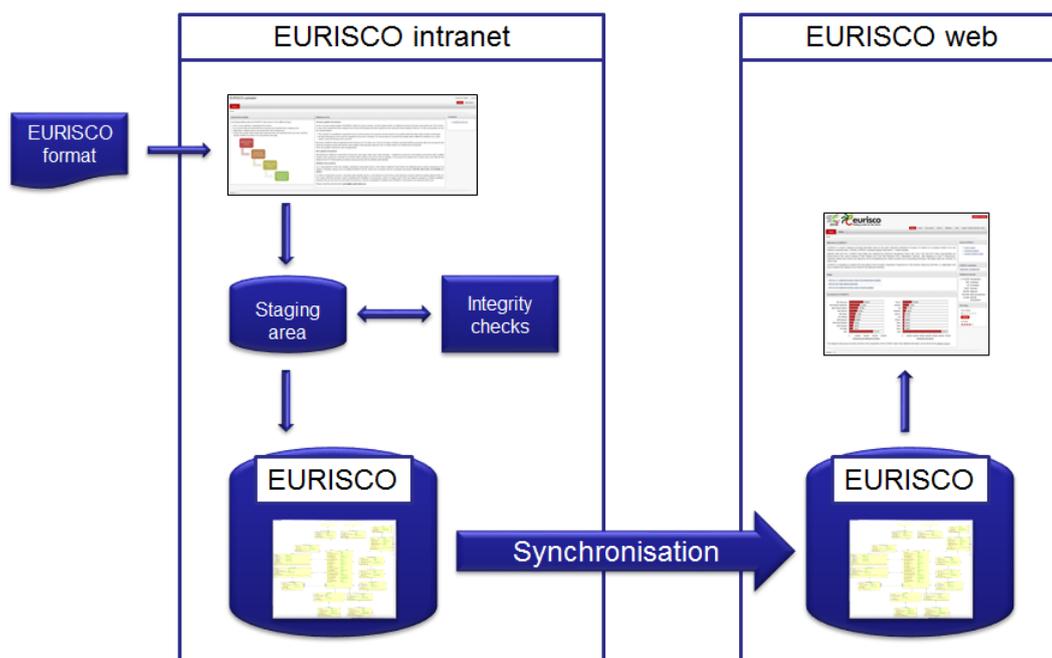


Fig. 2: Interaction of the EURISCO IT infrastructure during the import/Update of data.

2.2.3 Data migration

After re-engineering the target database schema, a first import was made in order to test the newly developed data migration path and data cleansing procedures. This dataset was a precondition for developing both the new public EURISCO search interface and the new EURISCO intranet described above.

After successful tests, a productive import with the up-to-date dataset was performed. Since end of September 2014, the URL <http://eurisco.ecpgr.org/> redirects to the new EURISCO system at IPK.

3 Current status

Since the transfer of EURISCO both infrastructure and content evolved continuously.

3.1 INFRASTRUCTURE

As at 12 April 2018, the EURISCO intranet comprises 59 tables, 502 indexes, 108 triggers, 14 PL/SQL packages with 177 functions and procedures (data upload and import, integrity checks, updates, both for passport and C&E data; taxonomy support etc.), and 27 Java classes.

The EURISCO frontend comprises 46 tables, 29 materialised views, 698 indexes, nine PL/SQL packages with 38 functions and procedures (download, newsletter, statistics, C&E data visualisation, AEGIS status auditing, taxonomy support etc.), and four Java classes.

Fig. 3 shows a screenshot of the EURISCO web application.

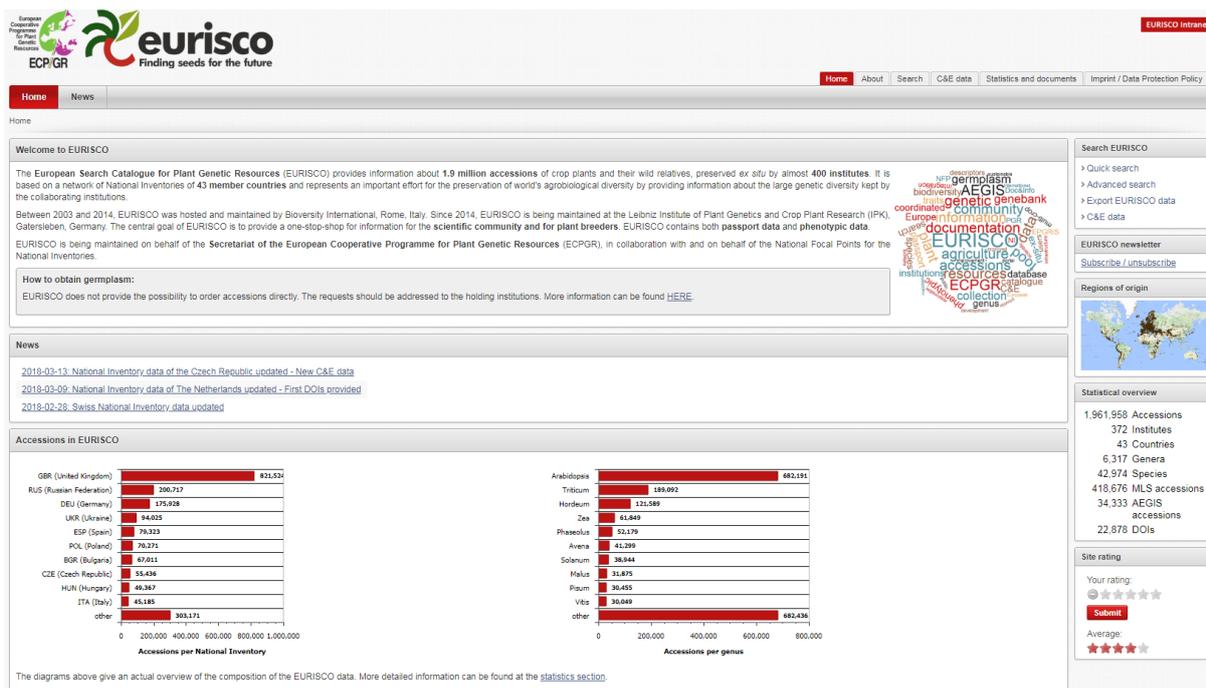


Fig. 3: Screenshot of the EURISCO web application.

3.2 CONTENT

Between 2014 and 2018, the number of accessions in EURISCO increased by 846,965 (Fig. 4). The system currently documents 1,961,958 accessions, which comprise 6,317 genera and 42,974 species. 418,676 accessions belong to the Multilateral System and 34,333 are part of AEGIS. For 22,878 accessions, a permanent unique identifier (DOI) is available. Tab. 1 gives an overview on the taxonomic composition of EURISCO.

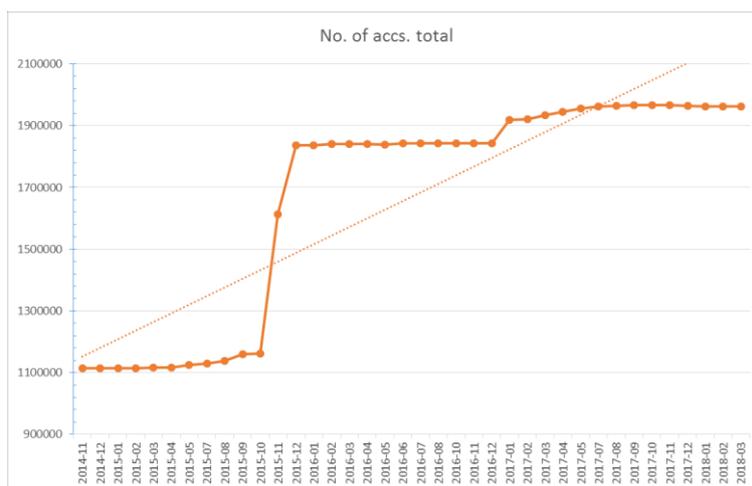


Fig. 4: Increase of the number of accessions in EURISCO.

Tab. 1: Taxonomic composition of EURISCO.

Genus	Species	No. accs.	Total
<i>Arabidopsis</i>	<i>thaliana</i>	681,983	682,191
	others	208	
<i>Triticum</i> (wheat)	<i>aestivum</i>	136,778	189,092
	<i>durum</i>	16,312	
	<i>turgidum</i>	9,601	
	<i>monococcum</i>	3,478	
	others	3,202	19,721
<i>Hordeum</i> (barley)	<i>vulgare</i>	104,374	121,589
	<i>spontaneum</i>	5,897	
	others	11,318	
<i>Zea</i> (maize)	<i>mays</i>	61,715	61,849
	others	134	
<i>Phaseolus</i> (garden bean)	<i>vulgaris</i>	46,621	52,179
	<i>coccineus</i>	3,064	
	others	2,494	
<i>Solanum</i> (tomato, potato, eggplant, etc.)	<i>lycopersicum</i>	19,152	51,265
	<i>tuberosum</i>	14,591	
	<i>andigenum</i>	2,814	
	others	2,119	12,589
<i>Avena</i> (oat)	<i>sativa</i>	33,274	41,299
	<i>sterilis</i>	2,152	
	<i>byzantina</i>	1,968	
	others	3,905	
<i>Malus</i> (apple)	<i>domestica</i>	24,759	31,875
	others	7,116	
<i>Pisum</i> (pea)	<i>sativum</i>	27,417	30,455
<i>Vitis</i> (grape)	<i>vinifera</i>	26,096	30,049
	others	3,953	
others			670,115
		Total	1,961,958

Fig. 5 illustrates the biological status of the accessions documented in EURISCO.

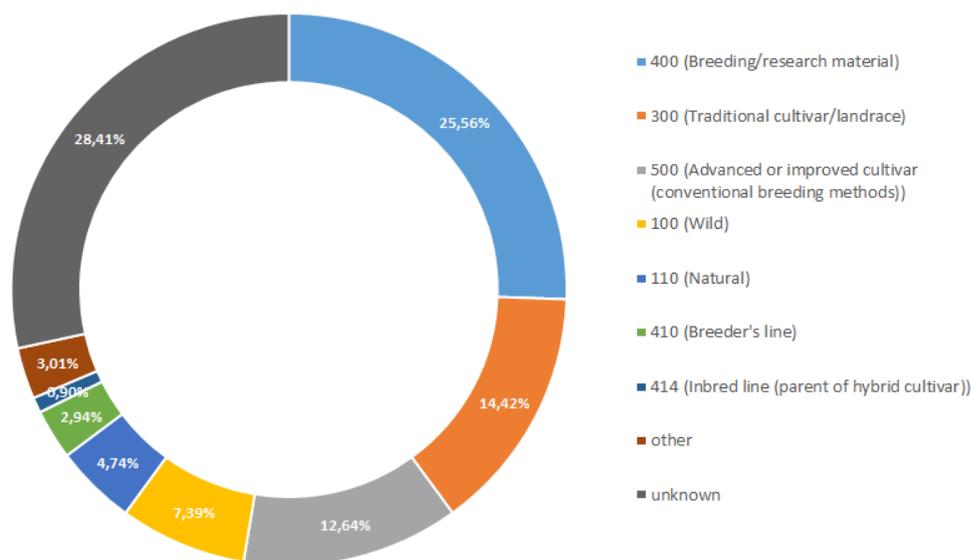


Fig. 5: Biological status of EURISCO accessions.

Currently, 1,652,895 records of characterization and evaluation (C&E) data from seven countries are available in EURISCO (Fig. 6). Thus, for 68,821 accessions, C&E data are available.

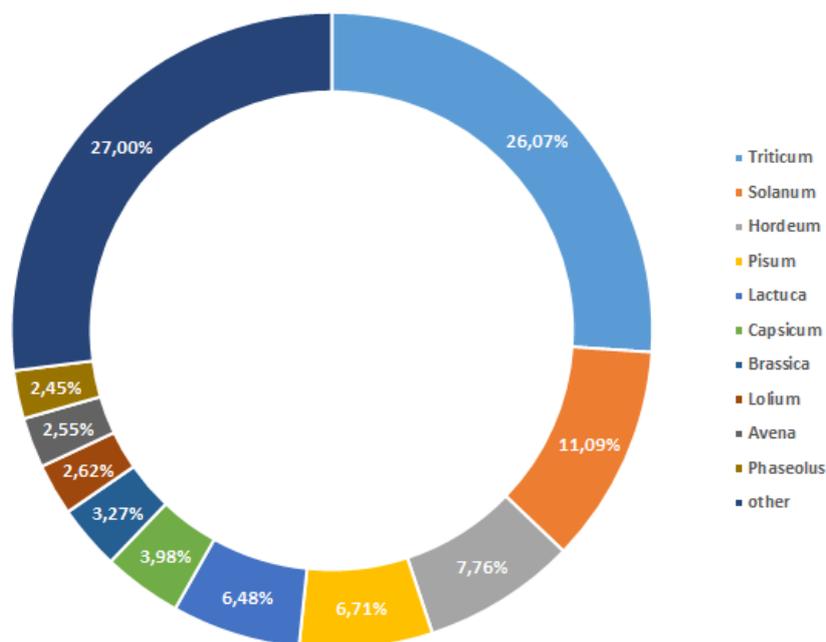


Fig. 6: Composition of the C&E data currently available in EURISCO.

4 Summary of EURISCO activities 2014 – 2018

As described above, EURISCO comprises a backend system (EURISCO intranet) and a frontend system (public EURISCO application).

4.1 DEVELOPMENT OF THE EURISCO BACKEND

2014

In 2014, the main focus of the development was on the re-engineering of the system at the new hosting institute as described in section 2.2.

The first new feature was the extension of the data upload mechanism for incremental updates. This change sounds simple, but its effects are significant.

In the previous system, no incremental updates of EURISCO data took place. This means that in case of an update, the whole dataset of an NI was first deleted and then replaced by the reworked whole dataset of this NI. This procedure resulted in two disadvantages:

- This mechanism was not efficient, especially if only a small number of accession records needed to be updated while the other data remained unchanged.
- All data belonging to an NI needed to be updated at once (all or nothing). It was not possible to successively update data of different collections (e.g. genebanks), which all belonged to the same NI.

Looking forward to the objective of integrating characterization and evaluation (C&E) data into EURISCO, they would have to be deleted and reimported as they are directly linked to an accession and its passport data.

2015

In 2015, the upload mechanism for National Inventory datasets was further extended. In order to improve the user-friendliness of the data import as well as to reduce encoding errors, which often occurred during the preparation of the text files in EURISCO passport data format, a Java-based tool

was developed for importing passport data from MS Excel files as an extension of the upload procedure described above. Therefore, a SAX-based parser with very low resource requirements was used. The development of the importer, which already started in 2014, was finished.

The data quality/integrity checks, which are performed during passport data imports, were improved (and will be improved continuously).

The functionality of the EURISCO intranet application was also improved in 2015. Noteworthy is the integration of an automatic tracking system for the AEGIS status of the accessions. In case of addition/removal of AEGIS accessions or in case the AEGIS status of existing accessions is changed, the ECPGR Secretariat is informed automatically and the information is also immediately accessible via the webpage of the European Collection under <http://www.ecpgr.cgiar.org/aegis/european-collection/>.

Due to the switch of the EURISCO update mechanism from full replacement to incremental updates, in order to remove accessions from EURISCO, the National Focal Points have to explicitly indicate which accessions should be deleted. In order to support this process, a procedure was implemented which runs during the import and which automatically compares a new dataset with the existing dataset of the respective National Inventory. The system then provides a report containing the identifiers of accessions, which no longer exist in the new dataset, grouped by holding institution. This list can be helpful for the user to identify which accessions could be candidates for deletion from EURISCO. Then, an explicit approval of the deletion by the NFP is required.

2016

In 2016, a new version of the web interface of the EURISCO intranet (extended for importing C&E data) was tested and made publicly available for the users.

In addition, the AEGIS support was improved. Procedures for checking the AEGIS status in case of accession removal were developed. Integrating these procedures into the EURISCO intranet application was scheduled for 2017.

The data quality/integrity checks, which are performed during data imports, were improved (to be continued in 2017). In addition, a prototypical extension for checking taxonomic terms provided to EURISCO against GRIN taxonomy was implemented.

2017

Based on preparatory works of 2016, the AEGIS support was further improved in 2017. Procedures for checking the AEGIS status in case of accession removal and/or de-flagging were embedded into the EURISCO intranet. The AEGIS status of accessions is now being checked automatically and in case of de-flagging National Focal Points (NFPs) are asked to provide a reason to be sent to the ECPGR Secretariat.

In order to improve the quality of taxonomic data, the EURISCO coordination raised additional funding for the one-year project "EURISCO taxonomy" (May 2017 – April 2018). The necessary database structures as well as procedures for mapping taxonomic terms from EURISCO onto taxonomic repositories, such as GRIN and Mansfeld, were developed. Once completed, during each data upload to EURISCO a taxonomy mapping will be performed automatically, thus providing suggestions in case of unclear taxonomic terms. In addition, the taxonomy mappings will also be used for improving the web search functionality in order to enable users to search material on taxa via synonyms, including similarity search. A prototype of an improved web search functionality was developed. The project is funded by ECPGR thanks to a contribution from the German Federal Ministry of Food and Agriculture.

How-to documents (handbooks) for both passport and C&E data uploads by NFPs have been developed comprising step-by-step instructions as well as assistance for troubleshooting. These documents are available at the EURISCO intranet only.

One of the main activities in 2017, however, was the implementation of the most updated version of the Bioversity/FAO Multicrop Passport Descriptors (MCPD2). Until then, the EURISCO passport data exchange format was still based on MCPD1 (2001), including some extra fields. However, the MCPD evolved since then; the current version (v2.1) was published end of 2015 and includes several additional descriptors. At the 2016 EURISCO Advisory Committee meeting in Angers, France, it was decided to implement MCPD2 for EURISCO (including additional descriptors).

Thus, the EURISCO infrastructure was updated to fully support the MCPD version 2.1. This included changes of the database schema, upload and check procedures as well as the public web interface. After finishing the necessary tests and consultations with FAO with regard to the harmonisation of the MCPD and EURISCO format, the final changeover took place in December 2017. Henceforward, EURISCO only accepts data in the MCPD v2.1 format plus four EURISCO-specific descriptors.

2018

With regard to the switch to the new data exchange format, experiences with the new format will be obtained from the data providers in 2018. In case of requests for modification, those will be evaluated for feasibility and will be implemented.

In 2018, the major focus of the ongoing “EURISCO taxonomy” project will be on using the taxonomy mappings for improving the web search functionality in order to enable users to search material on taxa via synonyms, including similarity search. In addition, the developed procedures will be used for improving the support of National Focal Points during data uploads as mentioned above. The aim is to perform an automatic mapping of the provided taxonomic terms, thus providing suggestions in case of unclear taxonomic terms, each time a new dataset has been uploaded to EURISCO. In this context, the how-to documents for National Focal Points will be updated.

4.2 DEVELOPMENT OF THE EURISCO FRONTEND

2014

As for the EURISCO backend, also for the frontend the 2014 focus was on reengineering the system.

As a first completely new feature, a new export function was implemented in the EURISCO web application, thus enabling the users to create customised export files for each National Inventory dataset. In addition, a possibility of downloading the whole EURISCO dataset as a pre-built dump in CSV format was provided.

2015

In 2015, the EURISCO web interface was extended by a statistics section in order to enable a fast overview about the accessions listed in the database. This comprised for example information about the respective National Inventories, the taxonomic composition of the whole collection or the type of germplasm storage.

Several improvements of the search functionality were performed (additional fields for filtering, more details for displaying etc.). A download option for selected passport data was also implemented.

Finally, several bugs were fixed and a variety of adjustments “under the hood” were made. Extensive cleansing of legacy data (as provided by the previous host) was performed.

2016

In 2016, besides establishing a C&E data search (see section 4.3), also the advanced search as well as the export functionalities were completely reworked. The advanced search, which allows users to freely combine all available fields within a single search, now supports multiple selection. The usability of the advanced search was improved significantly.

Besides the previously existing export by National Inventory passport datasets, users were now enabled to create user-specific export sets on species level. In addition, a full dump of the whole EURISCO dataset is still available, but was switched from CSV format to MS Access format.

Several pages were extended by dynamic actions in order to increase the user-friendliness of the web interface. Finally, several fixes and improvements were made.

2017

In 2017, a survey was conducted among the National Focal Points/National Coordinators in order to gather structured feedback and to collect new requirements for the public EURISCO web application. Feedback was received from 17 persons, whereby the overall response was quite positive. The main feature requests were:

- improvements of the search and filter possibilities,
- adding accession images,
- standardise crop names,
- adding additional reports,
- additional statistics for C&E data.

First improvements of the filter possibilities (e.g. case-insensitive searches) were already implemented; more improvements of the search interface are being implemented in the frame of the “EURISCO taxonomy” project (see above).

As requested by the EURISCO Advisory Committee, the date of last update of passport data as well as instructions for obtaining material from the holding genebanks were added to the web interface.

2018

In 2018, the feature requests received from the user survey will be evaluated for feasibility. A priority list for implementation will be developed.

In addition to the requirements mentioned above, at the 10th ECPGR Executive Committee meeting (October 2017) the wish was expressed that the topic of including genetic data should remain for consideration on the agenda of the EURISCO coordination. Thus, the possibility of including SSR data will be explored. Furthermore, a feature for downloading experiment-level C&E data was requested.

In general, possibilities of updating the user-specific export functionalities of EURISCO will be explored. Besides the full dump in MS Access format, all other download features provide data in CSV format only. Due to the fact that users are strongly accustomed to MS Excel files, it seems reasonable to also provide data in this format.

However, the extension of the EURISCO web interface is a permanent task, which will be performed continuously.

4.3 EXTENSION FOR C&E DATA

2015

During the year 2015, EURISCO was extended for characterization and evaluation (C&E) data. For this purpose, a data exchange format comprising five simple MS Excel templates was discussed within the ECPGR Documentation and Information Working Group (Doc&Info WG). For this format, the respective proposals by Theo van Hintum (CGN)¹ and Jonas Nordling (NordGen)² were used.

The EURISCO database schema (both the EURISCO staging area and the EURISCO web schema) was extended to allow for storing C&E data. Tools for parsing and uploading C&E data from MS Excel files

¹ [Inclusion of C&E data in EURISCO – analysis and options](#)

² [C&E data: the EURISCO standard](#)

as well as all necessary data integrity checks were implemented and tested. Two large test datasets from CGN and IPK were imported (for testing and for demonstrating the benefits of C&E data in EURISCO).

2016

A prototype extension of the EURISCO user interface for searching and filtering C&E data was developed. In 2016, this prototype was tested extensively. Feedback was collected from selected experienced users and several extensions were implemented. High emphasis was put on performance tuning tasks.

The new C&E data extension, publicly released in July 2016, provides different possibilities for searching characterization and evaluation data. Searches can be started by genus, experiment, trait, and by the combination of species and trait, respectively. The generated reports are available for download.

The first 427,602 records of C&E data from the Netherlands and from Latvia were made publicly available and searchable.

2017

In 2017, an additional procedure for uploading C&E data to EURISCO, which was developed for and approved by the ECPGR Steering Committee in August 2017, was fully implemented and tested. This procedure provides an additional option of uploading C&E data by enabling data provider institutions to directly submit data to EURISCO (Fig. 7).

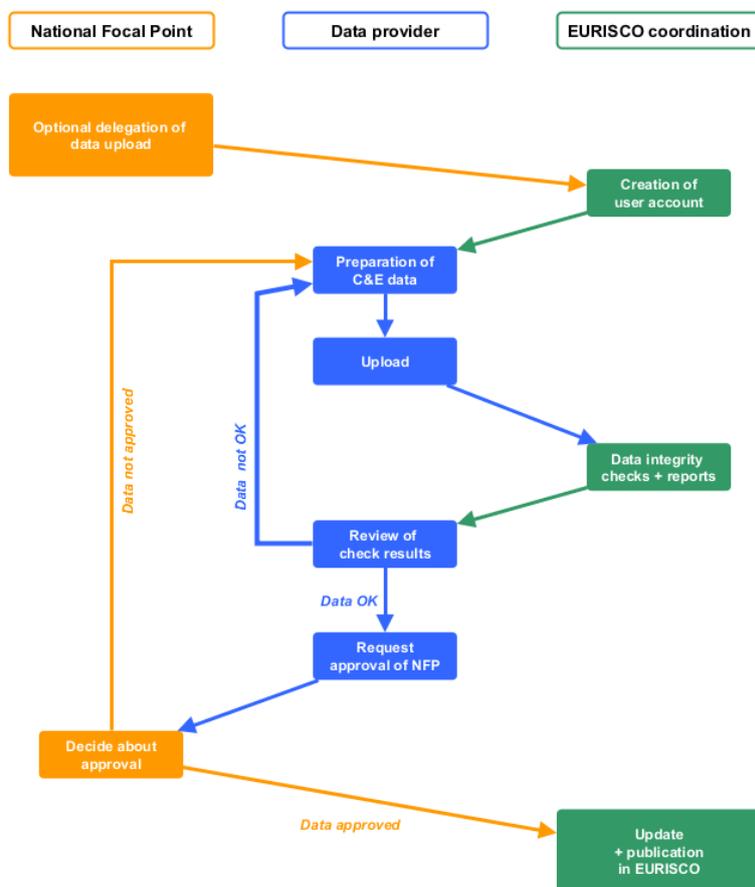


Fig. 7: Schematic illustration of the additional C&E data upload procedure for EURISCO.

2018

Feature requests for improving the C&E data extension of EURISCO will be collected and implemented continuously.

4.4 CONTINUOUS DOCUMENTATION

In parallel to the implementation of the separate modules of EURISCO, all developments are being documented.

5 EURISCO coordination

5.1 EURISCO NETWORK MAINTENANCE AND COORDINATION OF THE EURISCO DEVELOPMENT

The contact with EURISCO stakeholders was expanded continuously in order to demonstrate the potential of this joint European approach.

Much effort was invested into providing a helpdesk “behind the scenes”. Direct, personal communication took place with National Focal Points and National Coordinators (e.g. support for updates, provision of specific database queries and special data export formats, discussion about future developments).

Additional support will be provided for National Focal Points for possible questions arising from the recent update of the passport data exchange format as well as for cleansing/compiling C&E data for inclusion in EURISCO.

EURISCO is ready to support a potential European Evaluation Network under the umbrella of ECPGR.

The coordination of the future EURISCO development mainly comprises (i) the definition of new services, (ii) the advancement of current standards and (iii) the discussion and definition of new standards.

For reaching common goals, the EURISCO coordination will explore all possibilities for coordination with initiatives such as Genesys and the GLIS under the International Treaty, respectively.

In order to improve the coverage of EURISCO, we will focus on bilateral communication with the respective National Focal Points / National Coordinators. This will be a permanent activity. In this context, the EURISCO coordination will participate in activities under the ECPGR Grant Scheme (esp. with regard to C&E data).

At the end of every year, an activity report as well as a work plan for the following year are being prepared and published on the EURISCO website.

In addition, a draft plan will be developed on the basis of the ECPGR Objectives for Phase X.

5.2 EURISCO TRAINING WORKSHOPS

Regular training for data providers will especially be critical for C&E data and also in case of staff changes. Starting in 2015, the series of regional EURISCO training workshops was revived.

The first workshop, funded by the ECPGR Activity Grant Scheme (First Call, 2014), focussed on South-Eastern Europe, especially on the SEEDNet member countries, and was held 19–21 May 2015 in Tirana, Albania.

The workshop, organised in collaboration with the Agricultural University of Tirana, Department of Plant Sciences and Technology, brought together 20 participants, including 16 National Focal Points and/or National Coordinators. In order to run the training, all necessary training materials as well as a test environment for a hands-on training were developed.

The report and the presentations given during the workshop can be found [here](#).

A proposal for a second training workshop was approved for funding by the Second Call of the ECPGR Activity Grant Scheme (2015). The workshop focussing on participants from the Western European region was held 12–14 October 2016 in Angers, France.

The training, organised in collaboration with the French National Institute for Agricultural Research (INRA), brought together 13 participants. Besides passport data upload, the participants were also trained in uploading C&E data, using their own data. In order to run the training, all necessary training materials as well as a test environment for a hands-on training were updated.

The report and the presentations given during the workshop can be found [here](#).

Subsequent to the training workshop, the first meeting of the re-established EURISCO Advisory Committee took place. A progress report on EURISCO was given at this meeting and the minutes are available [here](#).

The third regional EURISCO training workshop was held in Gatersleben, Germany, 12–14 September 2017, and focussed on participants from the Central European region. It was organised in collaboration with the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) and brought together 14 participants. Besides basic training for National Focal Points, the focus of the workshop was on increasing the volume of characterization and evaluation (C&E) data records in EURISCO. The presentations given during the workshop can be found [here](#).

The 2018 training will again be jointly organised with the EURISCO Advisory Board meeting.

5.3 PARTICIPATION IN PROJECT PROPOSALS

The EURISCO coordination provided substantial legwork to the preparation of project proposals in order to acquire additional funding for the future development of EURISCO.

A Horizon 2020 proposal, EUCLEG, with the participation of the EURISCO coordination (work package leader) was approved in 2016. This project started in 2017 and is being coordinated by INRA, France. One of the tasks is to identify gaps in European alfalfa, red clover, pea, faba bean and soybean collections. Additional data (passport and phenotypic) will be provided to the respective NFPs in order to include them in EURISCO.

The Horizon 2020 proposal “Farmer’s Pride” with the participation of the EURISCO coordination (task leader) was approved and officially started in November 2017. This project is being coordinated by the University of Birmingham and focusses on the development of a network of *in situ* sites and stakeholders. The task of the EURISCO coordination will be the development of a concept for the extension of EURISCO for *in situ* data. Therefore, in 2018 an inventory of data to be integrated will be compiled.

In addition, the EURISCO coordination is leading the ongoing project “EURISCO taxonomy” (see section 4.1).

The EURISCO coordination will also participate in the proposal “GenRes Bridge – Joining forces for genetic resources and biodiversity management”, which is a joint proposal of the three European networks for plant, animal and forest genetic resources (ECPGR, ERFP und EUFORGEN), submitted for funding in February 2018.

In the frame of two ECPGR Grant Scheme (second call) Activities, the European Central Crop Databases (ECCDBs) managed by the ECPGR Forages and Barley Working Groups, respectively, were used to identify potential gaps in EURISCO. The concerned National Focal Points (NFPs) were informed about the results and asked for checking as well as for providing the missing information. So far, 19 NFPs responded. There are different reasons why those accessions were missing from EURISCO, e.g. accessions already contained in EURISCO but with changed identifiers; accessions not available

anymore; really missing accessions. Emerging from these activities, several new datasets were provided and will be provided to EURISCO.

5.4 DISSEMINATION

A presentation on EURISCO was given at the workshop “SEEDNet–the Way Ahead” (Ljubljana, Slovenia, 5–6 November 2014).

A poster on EURISCO was presented at the TDWG (Biodiversity Information Standards) 2015 Annual Conference “Applications, Standards and Capacity Building for Sustaining Global Biodiversity”, 28 September–1 October 2015, Nairobi, Kenya, and a poster “Plant Genetic Resources from the Balkan Peninsula in the World’s Genebanks” using EURISCO data along with FAO WIEWS and Genesys, was presented at the 2nd International Symposium for Agriculture and Food, 7–9 October 2015, Ohrid, Macedonia (FYR).

The C&E data exchange format developed for EURISCO was presented at the workshop “Metadata standards for linking characterisation & evaluation data to genebank accessions registered in Genesys”, 23 November 2015, Amsterdam-Schiphol, The Netherlands.

In 2015, a presentation on EURISCO was given at the workshop: “Genetic resources: conservation and trait improvement” (workshop of the GPZ [German Society of Plant Breeding] working group Plant Genetic Resources, 10–11 December 2015, Gatersleben, Germany).

A poster on EURISCO was presented at the German Plant Breeding Conference, 8–10 March 2016, Bonn, Germany.

A presentation on EURISCO and the European Information Infrastructure as a tool for the implementation of the ITPGRFA was co-authored with Lorenzo Maggioni, who delivered it at the First Meeting of the Scientific Advisory Committee on the Global Information System on Article 17 of the Treaty, 24-25 November 2016, Rome, Italy.

A talk on EURISCO was given at the TDWG (Biodiversity Information Standards) 2016 Annual Conference “Standards Supporting Innovation in Biodiversity Research and Conservation”, 5–9 December 2016, Santa Clara de San Carlos, Costa Rica.

An article about EURISCO was accepted for the 2017 annual database issue of Nucleic Acids Research (DOI: [10.1093/nar/gkw755](https://doi.org/10.1093/nar/gkw755)). It helped increasing the awareness of EURISCO among a wider audience.

A poster was shown at the EUCARPIA Conference in Montpellier, France, 8–11 May 2017.

EURISCO was presented by a talk at the workshop “Private Public Partnerships for the use of Plant Genetic Resources for Food and Agriculture”, Bonn, Germany, 7–9 June 2017.

A poster on EURISCO was presented at the 8th International Triticeae Symposium in Wernigerode, Germany, 12–16 June 2017.

A talk on EURISCO was given at the 13th International Symposium on Integrative Bioinformatics, 22-23 June 2017, Odense, Denmark, in order to strengthen the connection with the bioinformatics community.

The applicability of EURISCO in the context of phenotypic data of *Lolium perenne* was presented at the conference “Breeding Grasses and Protein Crops in the Era of Genomics”, Vilnius, Lithuania, 11-14 September 2017.

Starting in December 2015, the EURISCO newsletter is issued twice a year. This is considered very important for providing feedback to the EURISCO users.