

# FORAGES WG REPORT FOR PHASE IX (2014-2018)

Submitted to the 15th Steering Committee Meeting, Thessaloniki, Greece, May 2018  
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Date of compilation: 27 February 2018

## 1. CONTRIBUTION TO ECPGR OBJECTIVES

### 1.1. Achievements and success stories

*Outcome 1. AEGIS is operational. Accessions in AEGIS are characterized and evaluated.*

Within the context of the Forages 2020 Activity, work was conducted to encourage collection holders to initiate the process of recommending accessions for flagging in the European Collection. During the project the number of forage accessions flagged as AEGIS increased. The Netherlands and the Czech Republic had flagged forage accessions in EURISCO before the project started and Germany, the Nordic Countries and the UK flagged accessions during the preparatory phase. By the 1st of November 2015, 7024 forage accessions were flagged in EURISCO within the most important forage genera by the following countries: Czech Republic (236), Germany (2203), the Netherlands (841), Nordic Countries (1303) and UK (2431). Since then Estonia has flagged its first 53 forage accessions and Germany over 5800 additional accessions (Table 1).

**Table 1.** Forage accessions in EURISCO and the numbers flagged as AEGIS

Country	Total in EURISCO (Important genera)	AEGIS accessions 1/11/2015	AEGIS accessions 7/3/2017	AEGIS accessions 16/2/2018
Germany	13928	2203	2207	8044
Nordic countries	4428	1303	1303	1303
Czech Rep.	3939	236	291	291
Estonia	172	0	53	53
Netherlands	1032	851	851	851
UK	17445	2431	0*	0
<b>SUM</b>		<b>7024</b>	<b>4705</b>	<b>10542</b>

\*Unflagged due to administrative issues

The work on AEGIS continued within the ForageDataAccess project. A survey was sent out to all the members of the Forages WG and to the National Coordinators, asking for their opinions about why so few accessions are flagged for inclusion in the European Forage Collection. In the hope of making it easy to answer and thereby increasing the reply frequency, the survey consisted of a single question with multiple-choice answers. There was also the possibility to give general comments. A total of 15 answers were received, representing 19 European countries.

According to this survey the most important factor limiting the flagging of forage accessions for AEGIS is the lack of funding for regeneration. Of the 15 participants, 11 (73%) thought that this factor had an impact and 9 (60%) thought that this factor is the most important one limiting their flagging of accessions (Table 2). Other important factors are the uncertainty about funding during the coming years and unwillingness from institute leaders to prioritize the process to select AEGIS accessions. There is also concern about lack of funding for germination testing and the strict rule for unflagging accessions (Table 2).

**Table 2.** Answers to the AEGIS questionnaire sent out in 2017 (15 answers representing 19 countries). The participants were sent a table with the question and factors listed below and were asked: 1) does this factor have an impact? (yes/no) and 2) how important is this factor?

Question: **In your opinion, why are not more accessions from your collection flagged for inclusion in the European forage collection (AEGIS)?**

<i>Factor no.</i>	<i>Factor</i>	<i>Impact: No. of "Yes"</i>	<i>Importance: average (1= most important)</i>	<i>Importance: no. of "1" (1= most important)</i>
1	Lack of funding for regeneration	11	1,9	9
2	Lack of funding for germination testing	7	3,4	4
3	Not implemented a system for duplicate storage	4	3,5	3
4	Uncertainty about funding during the coming years (cannot assure long-term conservation)	6	2,1	5
5	The institute leaders do not want to prioritize the process to select AEGIS accessions (other tasks are considered more important)	6	2,1	4
6	The strict rule for unflagging accessions make me hesitate to flag accessions	6	2,6	2
7	The instructions about how to select and flag AEGIS accessions are unclear	1	4,2	1
8	The process for flagging AEGIS accessions is complicated	4	2,9	2
9	There are too many criteria to define an AEGIS candidate	5	2,7	1
10	Other factors?			

Work has been initiated within the ForageDataAccess project on verification of accessions and data in the European Forage Collection. The aim is to identify duplicate accessions as well as errors in crops' names, variety names and geographic coordinates and in this way improve the accuracy of searches and enable better sorting and production of summary statistics from EURISCO.

*Outcome 2. Quantity and quality of data in EURISCO have been increased. Functionality of EURISCO meets users' expectations.*

Within the context of the Forages 2020 project, a survey was performed on available characterization and evaluation (C&E) data on forages in Europe. The conclusion is that there is broad range of C&E data sets available. This represents a great potential for the use of such data when selecting PGR material for breeding, pre-breeding etc. However, there is a need to make this data publically available and readily downloadable. Plans were made to use some of the forage data sets as test cases for the C&E extension of EURISCO in cooperation with the EURISCO coordinator S. Weise. This was later implemented within the ForageDataAccess Activity and forage data sets were used as test cases during the development of the C&E module in EURISCO and then included in the module (see Table 3).

**Table 3.** Forage C&E records in EURISCO (as of 2018-02-16)

Forage genus	No. of C&E records in EURISCO
Lolium	28428
Poa	6611
Trifolium	292
Phleum	186
Agrostis	180
SUM	35697

A priority descriptor list for forages is being developed within the ForageDataAccess project and was discussed at the workshop in 2017. The aim is to develop a list with 5-10 traits that can be used for evaluation of AEGIS accessions to produce standardized basic characterization data. To provide better comparability of data, a choice of standard cultivars for each C&E trial should be clearly defined.

The development a European crop portal for forages was discussed at the workshop in 2017 and it was decided that a simple Forage Crop portal will be created.

An evaluation of the overlap between the forage (ECCDBs) and EURISCO was made within the ForageDataAccess project with the aim to identify potential gaps in EURISCO. The long-term aim is to make sure that important information available in the ECCDBs are uploaded into EURISCO. A large number of accessions in the ECCDBs are not present in EURISCO (43%, see Table 4), at least not under the same institution code, genus and accession number. The concerned National Inventory Focal Points (NFPs) were informed about the results and asked for checking as well as for providing the missing information. In addition to accessions that are actually missing or accessions that are not available anymore, in many cases the accession identifiers (unique combination of institution code, genus and accession number) changed. Emerging from these activities, several new datasets were provided and will be provided to EURISCO.

**Table 4.** Comparison of overlap between forage ECCDBs and EURISCO

No. of accessions in forage ECCDBs	No. of ECCDB accessions also found in EURISCO	No. of ECCDB accessions missing from EURISCO
104 234	59 265	44 969 (43%)

## 1.2. Gaps or constraints identified

During the joint Forage and Barley workshop in 2017, a list of recommended actions was developed and is available on the ECPGR website (see chapter 2 below). It includes recommendations on AEGIS, characterization and evaluation data in EURISCO, quality of data in EURISCO and visibility of European genetic resources, C&E data, EURISCO and ECPGR.

In particular, the questionnaire on AEGIS suggests that the lack of funding for basic genebank tasks, such as regeneration and germination testing, as well as uncertainty of future funding is a major constraint in the development of the European Forage Collection (AEGIS). This does not only pose a threat to the future development of AEGIS but even more importantly to the long-term survival of forage accessions in European genebanks.

## 2. GRANT SCHEME ACTIVITIES

- **Grant Scheme proposals (submitted: 2; approved: 2)**
  1. [ECPGR WG for Forages towards 2020s \(Forages 2020\)](#) – First Call (2014)
  2. [AEGIS progress and improved access to data on European Forage PGR \(ForageDataAccess\)](#) – Second Call (2015)
- **Total number of partners involved: 17 from 13 countries**
  - ECPGR-funded: 16 from 13 countries
  - Self-funded: 1 from 1 country
- **Meetings held**
  1. Forages2020 Workshop, 9-11 November 2015, Alnarp, Sweden.
  2. ForageDataAccess: joint workshop with the Barley C&E Data Activity, 14-16 March 2017, Malmö, Sweden.
- **Reports and related data**
  1. **Forages2020**  
Final Activity Report  
 [ECPGR WG For Forages towards 2020s \(Forages 2020\) - Activity report](#)

## 2. ForageDataAccess

Recommendations from the joint workshop with Barley C&E data, 14-16 March 2017, Malmö, Sweden.

 [Workshop recommendations](#)

- **Funds mobilized**

- ECPGR granted funds: € 31 500
- Inputs in-kind declared in Grant activities: € 50 000

## 3. OTHER ACTIVITIES (CROSS-WORKING GROUP ACTIVITIES, LINKS WITH OTHER NETWORKS, PROJECTS AND INITIATIVES)

- **Cross-Working Group activities**

In the frame of the Grant Scheme:

- Forages2020: joint proposal with Doc&Info WG and Wild Species Conservation in Genetic Reserves WG.
- ForageDataAccess: joint proposal with Doc&Info WG; joint workshop and recommendations with Barley C&E Data Activity.

In addition, the Forages WG has links with the Wild Species Conservation in Genetic Reserves WG via the projects “Wild genetic resources – a tool to meet climate change’ and “Farmer’s Pride”, see below. Through the latter there is also a link with the On-farm Conservation and Management WG.

- **Others**


- **GrassLandscape**: Some members of the Forages Working Group have been involved in the project *GrassLandscape - Bridging landscape genomics and quantitative genetics for a regional adaptation of European grasslands to climate change* (FACCE-JPI ERA-net+ 2014 call Climate Smart Agriculture). The project is coordinated by J.P. Sompoux, French member of the Forages WG. The consortium includes INRA and EPHE in France, IPK in Germany, IBERS in the UK and ILVO in Belgium. The main objective of the project is to detect genomic markers of climatic adaptation in the natural diversity of perennial ryegrass (*Lolium perenne*) and to use this information to adapt this species to the anthropogenic climate change foreseen to happen in next decades. The project has already delivered around 550 000 nuclear SNPs and extensive phenotypic data for 500 accessions from the natural diversity of *L. perenne* and related species and from *L. perenne* cultivars. Results of the project will provide new C&E data to feed the corresponding perennial ryegrass accessions in the EURISCO database and accessions used will be flagged in the European Forage Collection (EFC). Ultimately, genetic pools adapted to future regional climates of Europe are expected to be released and referenced in European collections.
- **Nordic CWR project** ‘Wild genetic resources – a tool to meet climate change’ 2017-2018. Funding for the project has been received from the Nordic Council of ministers, COP21 cooperation programme. The project has partners from Denmark, Finland, Iceland, Norway and Sweden, some of which are members of the Forages WG and of the Wild Species Conservation in Genetic Reserves WG.
- **Farmer’s Pride**. The proposal submitted by the Wild Species Conservation in Genetic Reserves Working Group and the On-farm Conservation and

Management Working Group coordinating team (with key additional partners) for H2020 SFS 04 2017 was successful. The project formally starts on the 1st November 2017 and will run for 3 years. Also some Forages WG members are directly or indirectly involved.


- **NordGen's Forage Working Group.** A Nordic working group on forages with members from all the five Nordic countries, some of which are also members of the ECPGR Forages WG.


#### 4. WORKING GROUP DOCUMENTS AND PUBLICATIONS

- **Working Group document**

Workplan for the Forages WG developed in the framework of the Forages2020 Activity (Task 3)  [Workplan for 2015-2018 and ideas for future work \(updated 12 February 2016\)](#)

- **Posters**

Blanco-Pastor JL, Manel S, Barre P, Dehmer K, Hegarty M, Muylle H, Roldán-Ruiz I, Roschanski AM, Ruttink T, Willner E, Sampoux JP. 2017.  [GrassLandscape. Genomic markers of climatic adaptation in perennial ryegrass](#). Poster presented at the FACCE-JPI Valorisation workshop on climate held on 22 March 2017, Brussels, Belgium.

Sampoux JP, Manel S, Hegarty MJ, Dehmer KJ, Willner E, Roldan-Ruiz I. 2015.  [Bridging landscape genomics and quantitative genetics for a regional adaptation of European grasslands to climate-change](#). Project 'GrassLandscape' awarded by the 2014 FACCE-JPI ERA-NET+ call 'Climate Smart Agriculture'. Poster presented at the conference Climate Smart Agriculture, 16-18 March 2015, Montpellier, France.

Bachmann-Pfabe S, Willner E, Oppermann M, Weise S and Dehmer KJ. 2017. Enhancing the sustainable use of *Lolium perenne* genetic resources from genebanks in plant breeding and research. Joint meeting of EUCARPIA Fodder Crops and Amenity Grasses Section and Protein Crops Section, September 11-14, 2017, Vilnius, Lithuania.

Palmé A, Marum P, Öhlund L, Leino M, Hagenblad J, Solberg S Ø, Asdal Å. 2014. Genetic consequences of *ex situ* and *in situ* conservation of plant genetic resources: An on-going study in red clover (*Trifolium pratense*). Poster presented at the conference Agriculture in a Changing Climate" 27-29 January 2014, Lillehammer, Norway.

Palmé A, Fitzgerald H, Weibull W, Asdal Å, Lund B, Endresen D, Kiviharju E, Þorbjörnsson H, Rasmussen M, Carlson-Nilsson U. 2017. A Nordic regional approach for crop wild relative (CWR) conservation. Poster presented at the conference EUCARPIA Genetic Resources; Crop diversification in a changing world; Mobilizing the green gold of plant genetic resources 8–11 May 2017, Le Corum, Montpellier, France.

- **Articles in international journals**

Solberg S O, Yndgaard F, Palmé A. 2015. Morphological and phenological consequences of *ex situ* conservation of natural populations of red clover (*Trifolium pratense* L.). Plant Genetic Resources: Characterization and Utilization 15:97-108 (doi:10.1017/S1479262115000416).

Frese L, Palmé A, Bülow L, Neuhaus G, Kik C. 2015. On the sustainable use and conservation of plant genetic resources in Europe. Crop wild relative 10:34-38 (can be downloaded at <http://www.pgrsecure.org/>).

Stamatova M. 2017. Variability of the structural elements of the productivity and correlation dependencies between them and hay yield at ecotypes and varieties of species *Festuca*

*pratensis* Huds. and *Festuca arundinacea* Schreber. Journal of Bioscience and Biotechnology, SE/Online, pp. 43-49. <http://www.jbb.uni-plovdiv.bg/en/SE-ONLINE-2017>

- **Web publications and data sets**

Nordic CWR webpages. 2017. NordGen. Main page: [www.nordgen.org/CWR](http://www.nordgen.org/CWR). Plant portraits for red clover, alsike clover, awnless brome, timothy etc. <https://www.nordgen.org/en/plants/crop-wild-relatives/species-information/plant-portraits/> (an on-going activity)

Fitzgerald H, Aronsson M, Endresen M, Palmé A, Weibull J, Asdal Å, Þorbjörnsson H, Ramussen M, Lund B, Kiviharju E. 2017. Nordic Crop Wild Relative (CWR) Checklist. v1.1. Nordic Genetic Resource Centre (NORDGEN). Dataset/Checklist. doi:10.15468/itkype

- **Articles in regional or national journals**

Weibull J, Fitzgerald H, Lund B, Palmé A, Þorbjörnsson H. 2016. Conservation and sustainable use of crop wild relatives: a Nordic initiative. Sveriges Utsädesförenings Tidskrift 2-2016.

Palmé A, Svensson J, Rasmussen M, Nilsson N. 2014. Breeding goals and actions to ensure future food security and sustainable growth. Discussion memo from the workshop “Visions for Nordic pre-breeding collaboration; PPP Seminar & Partner meeting”, 27-28 February, Reykjavik. Sveriges Utsädesförenings Tidskrift 2014(1): 32-35.

## **5. EXPECTED ADDITIONAL ACHIEVEMENTS AND FUTURE ACTIVITIES**

The Forages WG plan to submit a proposal to the sixth call within the ECPGR Activity Grant Scheme. The project will be coordinated by J.P. Sampoux and E. Willner and will aim to 1) upload new C&E data and possibly additional environmental descriptors collected for the *L. perenne* accessions studied in the GrassLandscape project into EURISCO, 2) flag different levels of core-collections for perennial ryegrass in EURISCO and 3) create perennial ryegrass genetic pools adapted to future regional climates of Europe.

The ForageDataAccess project will be finalized during the spring of 2018.