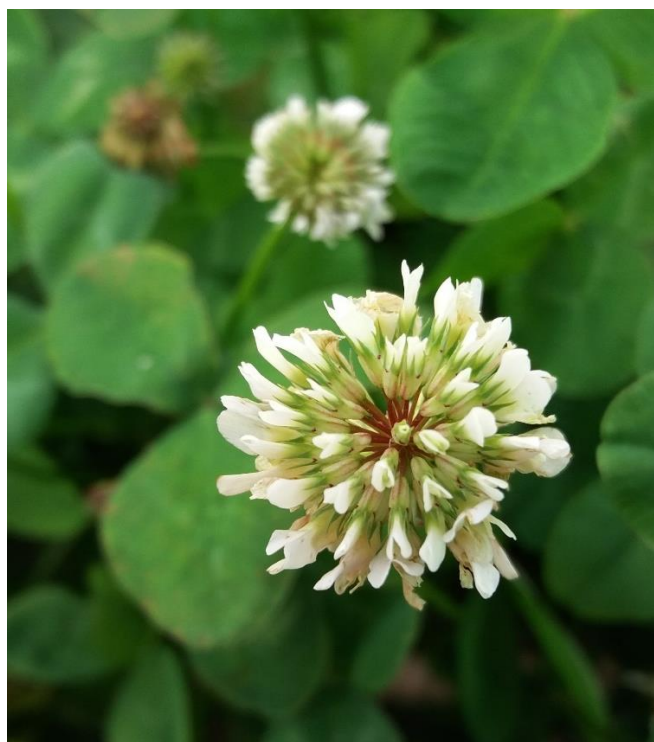


**AEGIS progress and improved access to data on  
European Forage PGR  
(ForageDataAccess)**

**1 September 2016 – 31 May 2018**

Anna Palmé, Evelin Willner, Petter Marum and Stephan Weise



A white clover accession conserved at NordGen, NGB17051 collected at Mörkö, Sweden.  
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**June 2018**

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## INTRODUCTION

The aims of this activity were (1) to continue working towards the establishment of the European Forage Collection (EFC) and (2) to improve the quality and quantity of data in EURISCO, improve database functions as well as the visibility of forage accessions in this database. Detailed aims are listed under each task.

The participants in the project are listed in Table 1.

**Table 1.** Participants in the project

<b>Name and Surname</b>	<b>Institute</b>	<b>Country</b>
Anna Palmé ( <b>activity coordinator</b> ; tasks 1.1-1.4, 2.1-2.5)	NordGen (the Nordic Genetic Resource Centre)	Sweden
Stephan Weise ( <b>lead tasks 2.4 and 2.5</b> ; tasks 2.1-2.3)	IPK (The Leibniz Institute of Plant Genetics and Crop Plant Research)	Germany
Evelin Willner ( <b>lead task 2.1</b> ; tasks 1.1-1.3, 2.4 and 2.5)	IPK (The Leibniz Institute of Plant Genetics and Crop Plant Research)	Germany
Ian D. Thomas ( <b>lead tasks 1.4, 2.2 and 2.3</b> ; tasks 2.4 and 2.5)	IBERS (The Institute of Biological, Environmental and Rural Sciences, Aberystwyth University)	United Kingdom
Petter Marum ( <b>lead tasks 1.1-1.3</b> ; tasks 1.4, 2.2-2.5)	Graminor AS	Norway
Aurélia Priet (tasks 1.1-1.3)	Unité de Recherche Pluri-disciplinaire Prairies et Plantes Fourragères	France
Maria Stamatova (tasks 1.1, 1.3, 1.4, 2.1, 2.3-2.5)	Institute of Plant Genetic Resources	Bulgaria
Wilhelm Graiss (tasks 1.1-1.3, 2.4 and 2.5)	HBLFA (Höhere Bundeslehr- und Forschungsanstalt) Raumberg-Gumpenstein, Abteilung für Vegetationsmanagement im Alpenraum	Austria
Kjell-Åke Lundblad (tasks 2.1, 2.4 and 2.5)	NordGen (the Nordic Genetic Resource Centre)	Sweden
<i>Valentin Maya Blanco (tasks 2.4 and 2.5)</i>	<i>CICYTEX (Centro de Investigaciones Científicas y Tecnológicas de Extremadura)</i>	<i>Spain*</i>
<i>Bartosz Tomaszewski (tasks 1.1-1.3, 2.4 and 2.5)</i>	<i>Plant Breeding and Acclimatization Institute</i>	<i>Poland*</i>
Christoph Grieder (tasks 1.4, 2.1 and 2.2)	Agroscope	Switzerland**

\* These countries had not paid the fee to ECPGR; therefore these partners could unfortunately not take part in the workshop.

\*\* This partner was self-funded.

## Workshop

A joint workshop of the [ForageDataAccess](#) and [Barley C&E Data](#) Activities was held in Malmö, Sweden in 2017. The meeting included joint sessions focusing on general information, EURISCO, scientific talks and crop portals, as well as separate forage sessions on AEGIS and forage-specific EURISCO issues.

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The workshop developed a list of recommended actions, provided in Annex 1 and also available on both Activities' webpages.<sup>1</sup> 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.

The meeting agenda can be found in Annex 2 and the list of participants in Annex 3.

## **TASK 1: AEGIS**

### **Introduction**

This task contributes to the ECPGR Objectives for Phase IX, Outcome 1: Activities 1.2.1 and 1.2.2.

The aims of this task were:

1. To continue the evaluation of progress made in the selection of AEGIS candidates and encourage collection holders to flag forage accessions for inclusion in the EFC (Activity 1.2.1)
2. To conduct an in-depth study focused on a few selected collections to identify the reason behind non-inclusion in the EFC (Activity 1.2.1)
3. Based on this, evaluate what would be needed to increase the number of accessions in the EFC and plan future actions targeted at increasing the number of AEGIS accessions (Activity 1.2.1)
4. Verification of accessions and related data in the EFC: 1) Identify errors in genus, species, crop name, variety names, latitude and longitude and 2) Identify duplicates (Activity 1.2.2).

### **Approach**

A survey was sent out to all members of the Forages Working Group (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 response rate, 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. At the same time collection holders were reminded of the AEGIS process. Progress of AEGIS flagging has been evaluated by extraction of data from EURISCO. Specific genebank collections were also discussed at the workshop.

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<sup>1</sup> <http://www.ecpgr.cgiar.org/working-groups/forages/foragedataaccess/>  
<http://www.ecpgr.cgiar.org/working-groups/barley/barley-ce-data/>

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## Results

Within the context of the [Forages 2020](#) project,<sup>2</sup> work was conducted to encourage collection holders to initiate the process of recommending accessions for flagging in the European Collection. By the 1st of November 2015, 7024 forage accessions were flagged in EURISCO (Table 2). Since then Estonia has flagged its first 53 forage accessions and Germany over 5800 additional accessions (Table 2), the latter within the timeframe of the current project.

**Table 2.** Number of forage accessions in EURISCO and 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 Republic	3939	236	291	291
Estonia	172	0	53	53
Netherlands	1032	851	851	851
UK	17445	2431	0*	0*
<b>Total</b>		<b>7024</b>	<b>4705</b>	<b>10542</b>

\*Unflagged due to administrative issues (Associate Membership Agreement not yet signed by the institute)

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 3). 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 3). The pattern identified in the survey was also confirmed during discussions of particular collections at the workshop.

The work on identifying errors and duplicates in EURISCO was initiated (see [the related presentation given at the workshop](#)) but unfortunately it was not possible to finalize this in time for this report.

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<sup>2</sup> "ECPGR WG for Forages towards 2020s" (Forages 2020) - Activity funded by the ECPGR Activity Grant Scheme, First Call. See <http://www.ecpgr.cgiar.org/working-groups/forages/forages-2020/>

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**Table 3.** 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?			

### **Recommendations**

It is clear that the major constraint concerning flagging of AEGIS forage accessions is the lack of long-term funding for basic genebank tasks. Both current funding and uncertainty about future funding are issues. If this problem is not resolved, the long-term survival of the accessions in many European genebanks cannot be guaranteed. Our main recommendation is therefore to address this problem within the ECPGR. Some ideas on how to do this are listed in the recommendations from the workshop (Annex 1) under the heading "AEGIS".

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The WG feels that the main factor limiting the flagging of AEGIS accessions, the lack of long-term funding for basic genebank tasks, is somewhat outside the scope and responsibility of the WG. This makes it difficult to plan for appropriate WG tasks to directly address this issue. We can work in different ways to facilitate the use of genetic resources by improving access to information (See Annex 1, last three sections on EURISCO and visibility) and plan to do this in the future. This can spread information about genetic resources and their use and importance, which in turn can affect politicians assigning budgets.

## **TASK 2: EURISCO - IMPROVED QUALITY AND QUANTITY OF DATA**

### **Introduction**

This task contributes to the ECPGR Outcome 2 (Activities 2.1.1, 2.2.1 and 2.4.2) as well as to Outcome 1 (Activity 1.2.1).

The aims of this task were to:

1. Develop 1) a demo version for inclusion of characterization and evaluation (C&E) data in EURISCO (tested with forage data sets from different genebanks), 2) a procedure for data flow (technical and legal aspects), and 3) an “Official procedure test” (Activity 2.2.1)
2. Include forage-specific descriptors into EURISCO: 1) Extract the fields from the Crop Databases that are not in EURISCO and make a separate table, 2) Discuss with the Forages WG, the ECPGR and EURISCO about how this information can be conserved in EURISCO (Activity 2.4.2)
3. Initiate the development a European crop portal for forages (gateway). Set up a crop portal presenting data on the forage accessions in EURISCO and also information on, and links to, the European forage collections.
4. Use data in the European Crop Databases (ECCDBs) to identify potential gaps in EURISCO and inform the National Focal Points of these gaps (2.1.1)
5. Evaluate if new features in EURISCO could be developed to facilitate the AEGIS process (facilitate Activities 1.2.1 and 2.4.2).

### **Materials and Methods / Approach**

EURISCO was extended for the management of C&E data. In this context, the Forages WG provided test data as well as very valuable feedback for the design of the C&E module.

In order to foster the process of adding forage data into EURISCO, the overlap between the forage ECCDBs and EURISCO was assessed. The identified potential gaps were communicated to the National Focal Points (see section “Results”).

Possible feature extensions of EURISCO were discussed. Some of them were scheduled for implementation.

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## Results

Forage data sets were used as test cases during the development of the C&E module in EURISCO, now available online at <http://eurisco.ecpgr.org>. The test cases were then included in EURISCO (see Table 4) and are now accessible online.

A draft [Priority descriptor list for forages](#) has been developed within the project and was discussed at the workshop in 2017. The aim is to develop a list with 5 to 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 European *Poa* Database (<http://poa.ipk-gatersleben.de>) was developed into a crop portal. This can serve as an example for how a crop portal can function. Both passport and C&E data from EURISCO are displayed on this portal and updated automatically from EURISCO. This avoids the problems with manual updating and provides a user-friendly gateway for users specifically interested in *Poa*.

**Table 4.** Forage C&E records in EURISCO. Recently, the Czech Republic added a large set of C&E data (including forages) to EURISCO, which is represented in the third column.

Forage genus	No. of C&E records in EURISCO (at 2018-02-16)	No. of C&E records in EURISCO (at 2018-03-13)
<i>Lolium</i>	28428	43318
<i>Poa</i>	6611	11176
<i>Trifolium</i>	292	22884
<i>Phleum</i>	186	3341
<i>Agrostis</i>	180	2132
<b>Total</b>	<b>35697</b>	<b>82851</b>

An evaluation of the overlap between the forage ECCDBs and EURISCO was made within the 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 is uploaded into EURISCO. A large number of accessions in the ECCDBs are not present in EURISCO (44%, see Table 5), 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 to check and to provide 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) has changed.

Emerging from these activities, several new datasets were provided and will be provided to EURISCO.



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**Table 5.** Comparison of overlap between forage ECCDBs and EURISCO (at 2017-10-24)

<b>No. of accessions in forage ECCDBs</b>	<b>No. of ECCDB accessions also found in EURISCO</b>	<b>No. of ECCDB accessions missing from EURISCO</b>
104 234	58 517	45 717 (~44%)

### **Recommendations**

See Annex 1, sections on “Characterization and evaluation data in EURISCO”, “Quality of data in EURISCO” and “Visibility of European genetic resources, C&E data, EURISCO and ECPGR EURISCO”.

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## **Annex 1. Workshop Recommendations**

Listed below are recommendations from the ECPGR Forages and Barley workshop, 14-16 March, 2017, Malmö, Sweden. The workshop was a joint activity of the ECPGR projects “ForageDataAccess” and “Barley C&E Data”.

### **AEGIS**

The lack of stable long-term funding for genebank operations is a major problem. A survey among forage collection holders suggests that lack of funding for regeneration is the most important reason why not more forage accessions have been flagged for the European Collection. We suggest the following actions to stimulate progress for AEGIS:

1. Introduce the term “AEGIS candidate”, which would be different from a standard AEGIS accession. AEGIS candidate would signify accessions that are unique and should become AEGIS accessions but need regeneration or other action. It could be introduced as a new state (no. 2) within the current AEGIS MCPD descriptor (no. 35). The aim would be to make the need for action and additional funding more visible.
2. ECPGR should work towards strengthening the basis for funding for genebanks in Europe. Different approaches should be explored, for example cooperation with funding agencies, lobbying for increased funding on the European level and strengthening the status of ECPGR and AEGIS. The latter could be achieved by
  - Exploring options for AEGIS to gain ERIC (European Research Infrastructure Consortium) status to improve long-term funding opportunities and a more integrated system for sharing of responsibilities for regeneration.
3. A system with mentorship could stimulate collection holders to flag accessions. In such a system genebanks with experience of flagging AEGIS accessions could mentor those that have not done so. ECPGR could for example offer travel support within the grant system.
4. The Executive Committee should encourage the National Focal Points (NFPs) to work together with the collection holders and flag accessions for AEGIS.

### **Characterization and Evaluation data in EURISCO**

The first data sets have been uploaded into EURISCO and the system for upload, display and download of C&E data is functioning (though modifications to meet user needs and wishes will be performed later). We recommend:

5. Actions should be initiated to encourage upload of C&E data on a larger scale. The workshop suggests that efforts should be made to involve the National Focal Points. These are people that have the technical expertise to transform the data into the correct format (which can appear daunting for non-experts).
6. Development of a EURISCO feature for downloading of C&E data at experiment level would allow users to perform their own analysis. Ideally, the download options would also append passport data of the accessions included in the experiment.
7. Evaluate the possibility to include C&E data from accessions that are currently not documented in EURISCO, if included in an experiment together with EURISCO accessions.

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8. A study on the feasibility of assigning digital object identifiers (DOIs) to uploaded C&E experiments. The presence of a DOI makes datasets of C&E experiments “citable” for users and it would allow uploaders and EURISCO to track the use of the data by citation count.

**Quality of data in EURISCO**

The quality, not only the quantity, of data in EURISCO is very important. Errors and inconsistencies in the data hinder users to efficiently search for information.

9. We support the establishment of a quality check system in EURISCO, for example regarding taxonomy and geographic coordinates.
10. We support actions to encourage collection holders to adopt common naming practices and clean their data of errors.
11. Lower quality data, such as poorly documented field observations, can be included but should have a “warning” explaining the limitations.

**Visibility of European genetic resources, C&E data, EURISCO and ECPGR**

The workshop considers that the awareness of breeders and other users about genetic resources available at European genebanks and about the associated C&E data is too low. Actions should be taken to broaden/spread this knowledge:

12. Crop portals could be a way to not only inform about specific crops but also channel users into relevant parts of EURISCO and the ECPGR homepages. The workshop participants agreed that a European Crop Portal should:
  - a. Aim at increasing the knowledge about the crop, the genetic resources available in Europe, C&E data and at the same time increase the visibility of EURISCO and ECPGR.
  - b. Be hosted under the umbrella of ECPGR.
  - c. Be “owned” by the relevant Working Group (not individual persons).
  - d. Channel users into a relevant view (“subpage”) of EURISCO devoted to the specific crop.
  - e. The Forages WG will set up a simple Forage Crop Portal during 2017 and this can serve as an example of how such a portal can look and function.
  - f. The Barley WG will postpone development of a barley portal until discussions have been held with the Wheat and *Avena* WGs on the possible development of a joint cereal portal and about potential overlap with other similar initiatives.
13. Actions directly targeted towards breeders and pre-breeders should be initiated to inform about the new C&E module in EURISCO and the type of data available. This should include presentations of EURISCO on conferences.
14. The inclusion of EURISCO as data provider for GBIF (the Global Biodiversity Information Facility) should be updated and extended for C&E data. Each holding institution should appear as separate data owner.
15. Explore additional data-publishing pathways from the data publishing genebank to the NFPs and EURISCO utilizing the GBIF data-publishing infrastructure, including support and training from the national GBIF Node helpdesks that are established in GBIF member countries.

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**Annex 2. Workshop Agenda**

## **Forages and Barley ECPGR workshop**

14-16 March 2017, Malmö, Sweden

A joint meeting of the ECPGR projects “ForageDataAccess” and “Barley C&E Data”

*Location:* Elite Hotel Savoy, Norra Vallgatan 62, 211 22 Malmö  
Rooms “Lilla salen”, “Empiren”, and “JF Horn”

### **March 14**

<b>When</b>	<b>What</b>	<b>Who</b>
13:00 –14:00	<b>Arrival and lunch</b> (at Elite Hotel Savoy)	
<b>Welcome session</b> (Chair: Ian D. Thomas) Room: “Lilla salen”		
14:00	Welcome to the meeting	Anna Palmé and Jan Svensson
14:05	Roundtable introductions of participants	All
14:25	NordGen Welcome	Roland von Bothmer
14:40	Introduction to the project “Forage Data Access”	Anna Palmé
14:50	Introduction to the project “Barley C&E Data”	Jan Svensson
15:00	Information and updates from ECPGR, including their vision of the future for AEGIS	Eva Thörn
15:30	Q&A	Chair
15:40	<b>Coffee/Tea</b>	
<b>Session 1:</b> Characterization and evaluation data in EURISCO (Chair: Külli Annamaa) Room: “Lilla salen”		
16:10	A priority descriptor list for forages	Evelin Willner
16:20	Gaps in EURISCO compared to the ECCDBs	Stephan Weise
16:30	What can a C&E module in EURISCO give us? Presentation of the demo version for C&E data in EURISCO	Stephan Weise
17:10	Q&A on the C&E module	All
17:50 – 18:00	Summing up	Chair

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**March 15 (Forage and Barley sessions in parallel in the morning)**

**Forage sessions**

<b>Session 2a: AEGIS Forages - establishment of the European Forage Collection (Chair: Evelin Wilner). Room: "Empiren"</b>		
9:00	General progress on the European Forage Collection (EFC) and results from the questionnaire	Petter Marum
9:30	Why are not more forage accessions in the EFC (AEGIS)? The French perspective	Aurélia Priet
9:40	Why are not more forage accessions in the EFC (AEGIS)? The Bulgarian perspective	Maria Stamatova
9:50	Why are not more forage accessions in the EFC (AEGIS)? The Austrian perspective	Wilhelm Graiss
10:00	Discussion	Chair
10:30	<b>Coffee/Tea</b>	
<b>Session 3a: Forage data in EURISCO and WG plans (Chair: Maria Stamatova) Room: "Empiren"</b>		
11:00	Error and duplicate identification in forage accessions in EURISCO	Ian D. Thomas
11:30	What forage-specific descriptors are missing from EURISCO?	Ian D. Thomas
11:50	Workplan for the ECPGR WG on Forages – progress and future plans	Anna Palmé
12:05	Discussion	Chair
<b>12:30</b>	<b>Lunch</b>	
13:30	Guided tour in Malmö	All
15:30 – 16:50	Discussion (including Coffee/Tea)	All

**Discussion questions forages**

- What tasks from the Forages workplan would be most important to prioritise 2018?
- What would be needed to increase the number of accessions in the EFC (AEGIS)? (WG tasks and recommendations to the ECPGR)
- Crop-specific standards for forages (discuss the draft commented by the ECPGR secretariat, see separate document)
  - Optimal/minimum number of plants to sample when collecting (4.1.5)
  - Number of seeds used for germination testing (4.3.2)
  - Proportion of the collection that should be characterized (4.5.1)
  - Other issues
- What forage-specific descriptors should be included in EURISCO (if any)?
- Are new features needed in EURISCO to facilitate the AEGIS process?
- How can the process of entering C&E data into EURISCO be facilitated?

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**Barley sessions**

<b>Session 2b: AEGIS Barley - establishment of the European Barley Collection (Chair: Helmut Knüpfper). Room: "JF Horn"</b>		
9:00	Update on previous activities	Jan Svensson
9:10	Current status of the European Barley Collection (AEGIS)	Jan Svensson
9:30	New AEGIS collections from Estonia	Küllli Annamaa
9:40	New AEGIS collections from Italy	Alessandro Tondelli
9:50	New AEGIS collections from Austria	Wolfgang Kainz
10:00	New AEGIS collections from UK	Adrian Turner
10:10	Discussion	Chair
10:30	<b>Coffee/Tea</b>	
<b>Session 3b: Barley WG plans (Chair: Adrian Turner). Room: "JF Horn"</b>		
11:00	Workplan for the ECPGR Barley WG – future plans	Jan Svensson
11:10	Crop-specific genebank standards - AQUAS for Barley	Jan Svensson
11:20 – 12:30	Discussion	Chair
<b>12:30</b>	<b>Lunch</b>	
13:30	Guided tour in Malmö	All
15:30 – 16:50	Discussion sessions (including Coffee/Tea)	All

Discussion questions Barley

- Workplan for the ECPGR Barley WG – future plans
- Crop-specific genebank standards - AQUAS for Barley

**Both Forages and Barley groups:**

<b>Discussion session (Chair: Ahmed Jahoor) Room: "Lilla salen"</b>		
17:00	Reporting from the group discussions	Chairs of each discussion group
17:50 – 18:00	Summing up	Chair

**Common dinner in Malmö 19:00**

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**March 16**

<b>Scientific talks</b> (Chair: Anna Palmé) Room: "Lilla salen"		
9:00	Conservation of regional genetic resources from semi-natural grassland (G-Zert)	Wilhelm Graiss
9:30	Genomic selection in barley	Ahmed Jahoor
10:00	<b>Coffee/Tea</b>	
<b>Session 4: European Crop Portals for forages and barley</b> (Chair: Petter Marum) Room: "Lilla salen"		
10:20	GBIF data portal	Dag Endresen
11:20	A European Crop Portal for Forages	Ian D. Thomas
11:35	Discussion on the Crop Portal for Forages (What should be included in the portal?)	All
12:05	A European Crop Portal for Barley	Jan Svensson
12:20	Discussion on the Crop Portal for Barley (What should be included in the portal?)	All
12:50	Summing up	Anna Palmé and Jan Svensson
<b>13:00 – 14:00</b>	<b>Lunch</b>	



**AEGIS progress and improved access to data on European Forage PGR  
(ForageDataAccess)**

**Activity Report**

**Annex 3. Workshop Participant list**

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