



ENDURE

European Network for Durable Exploitation of crop protection strategies

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Database of available resources, with recommendations for ensuring security and/or centralisation identified and networks of sites to support field experimentation on different scales

http://www.land-lab.org/endure_v1/v2/

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PP Restricted to other programme participants (including the Commission Services)	
RE Restricted to a group specified by the consortium (including the Commission Services)	x
CO Confidential, only for members of the consortium (including the Commission Services)	



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Glossary

CRBD	Completely Randomised Block Design
EPPO	European and Mediterranean Plant Protection Organization
MySQL	An RDBMS programme which runs as a server allowing multi-user access to multiple databases
PHP	Server-side scripting language used to produce dynamic WebPages
RDBMS	Relational Database Management System
VL	Endure Virtual Laboratory

Summary

This deliverable is based on the capture and processing of data relating to resources and facilities held by ENDURE partners during the first 18 months of the Network of Excellence. The first phase of data collection concentrated on facilities, with the emphasis on field experiment sites. The field experiment sites table (ExperimentalSites) was the first to be delivered and was presented during the plenary session of the 1st ENDURE Annual Meeting in Versailles. In the meantime, a request was made to ENDURE partners to provide information on resources. Subsequently, all data on facilities and biological resources were developed into the database table Resources. During the data collection process a number of issues arose and recommendations are made in this deliverable document as to the best way to ensure the security of the various resource collections held within the ENDURE Network. The database has now been delivered via the ENDURE test server hosted by SSUP in Pisa, Italy.

1. Development of a database of resources and facilities within the ENDURE Virtual Laboratory

1.1. Aim and objectives

The ENDURE Virtual Laboratory (Fig. 1) was initiated in the Network of Excellence as a means of facilitating joint research programmes, and of ensuring the durability of the partnership beyond the current period of funding. At its core is the need to establish a set of shared tools, resources and facilities to serve our current research activities, but also equip us to meet the challenges and demands presented by changing agricultural scenarios in the EU. During the first JPA, a key activity within the virtual laboratory was the development of a database to integrate and make available resources and facilities provided by ENDURE partners to other members of the consortium. Principally, the database would assemble reference strains of arthropods, weeds and plant pathogens, DNA and RNA libraries and collections of crop cultivars and germplasm and that a key objective would be to safeguard the security and storage of unique resources. In addition, the database would provide information on existing research equipment and facilities with a special emphasis on identifying a network of adequately-equipped field sites that encompass the differing climatic conditions, soil types and pest problems across the EU. Needless to say, this has required a process of prioritisation and a very close liaison with other activities in the Network directed towards data storage, management and interrogation.

1.2. Database structure and development

The data held in the VL are stored in several tables in a MySQL database, administered through a phpmyadmin RDBMS. *Ad hoc* PHP web pages are coded to interact with the database tables, such as displaying data, and editing and adding new data. As well as viewing “flat data”, some data are displayed in an embedded Google Map. All data will be browsable and searchable.

The main tables currently held in the VL are:

VLdatabases: This is the main table which other tables feed off. It contains the field *db_id* which relates to which part of the VL any data belong to, e.g. *db_id* =1 relates to Experimental Sites.

ExperimentalSites: Pertaining to field sites of ENDURE partners around Europe. These data are used to drive a browsable Google Map.

Resources: Contains data about analytical equipment, laboratories, controlled environment facilities (including glasshouse facilities) and inventories of biological material.

systemscs: The results of an online questionnaire about systems case studies. This is linked to the datasets section of the Resources table.

Biological and organisational information are held in text fields, but these will be linked in to the ENDURE commons database once this unified structure for nomenclature and cross-referencing become available (VL3.0).

Data held within the current version of the VL (VL2beta) can be viewed at:

http://www.land-lab.org/endure_v1/v2/

1.3. Biological resources

1.3.1. Collection of data and integration into database

Individual requests (See Appendix 1) were made to the contact scientist(s) of relevant ENDURE partners for information on collections of:

- 1 Arthropods, nematodes, weeds or plant pathogens
- 2 DNA/RNA reference libraries)
- 3 Germplasm/crops expressing pest resistance traits.

A challenge, not unexpected, to the collection of data on both “biological resources” and (as described later) “facilities” was the variation in level of detail of information/data supplied by different partners. This often required persistent repeat requests for information and/or clarification of detail but most partners were responsive, especially to personal requests as opposed to mass mailings. The collected information is undoubtedly non-exhaustive, but an excellent first step towards cataloguing and evaluating the resources available.

All input from partners has been collated into the “Resources” table within the database (Fig. 2), giving a total count of 635,286 individual data instances (e.g. 249 arthropod lines, 16225 nematodes lines, 300 weed species, 27878 pathogen isolates, 411 nucleic acid sample/sequences and 290223 individual plant lines). The collection also contains details of the Rothamsted Archive, a resource with over 300,000 items from the classical experiments including soil and crop samples collected over the last 165 years.

1.3.2. Limitations of the “Biological Resources” data and recommendations on ensuring security and/or centralisation of material.

At the outset of ENDURE, the expectation of IA2.1 was “investigating and (if appropriate) implementing a standardised system for naming and labelling of this material” and that “Safeguarding the security and storage of unique resources will also be a key objective”. Fairly early on in the data collection process, it was realised that these initial objectives were far too ambitious and were certainly not appropriate for a number of reasons. The problem with the collections from all partners is that biological resources are, by their very nature, dynamic. For example, isolates and insect lines die, plant seeds become non-viable with time. Secondly, maintenance of collections is time consuming and financially costly. This means that, apart from collections run on a commercial or semi-commercial basis (of which there are very few), collections tend to be personal, maintained by individual bench scientists who maintain small quantities of biological material pertinent to their specific project at that specific time point.

The two main points highlighted above combine to make any database on such a large collection of material only a snapshot at any particular point in time. We recommend that there is a need to qualify the collections with respect to ongoing research activity within ENDURE in order to highlight specific resources that are of major generic value or are unique to the network. Only after a review of what material may be critical to ongoing and future ENDURE activities will it be possible to decide on a strategy to ensure the security of that sub-set of material. Thus, this deliverable should be seen as only the starting point for the use of the ENDURE Collections database.

1.3.3. Review process

Now that the VL and associated databases are being delivered, it is essential that the VL becomes self-sustaining. Initially, there is a need for partners to assess the information provided already and using the “open”, online interface that has been created, participating Partners should regularly check database entries purporting to their interests and add/delete/update as fit, to ensure the data are as current as possible. To kick-start this process, scientists who provided information will be encouraged to visit the VL to check their individual data. It is planned that there will be an IA2 “Data Review Workshop” at INRA Dijon in September 2008 (M 21) when current database entries will be reviewed and a strategy for forward development and use of the database will be discussed. Further discussion and exposure of the collections database and the VL will take place in Montpellier (M 22).

1.4. Integration and sharing of facilities

1.4.1. Collection of data and integration into database

With a special emphasis on field experimentation data, data collection was done using a two stage process starting with the collection of data on field experimentation sites, followed by the collection of information on other facilities later. This was done using a questionnaire form with partners asked to complete the Field experiments section first (during M6) and complete the remainder later on during the project (M7 onwards) (Appendix 2) As with collection of information on “biological resources, a common problem was the variation in level of detail of information/data supplied by different partners, requiring repeat requests and/or the need for clarification of detail. Again, most partners were responsive, especially to personal requests as opposed to mass mailings.

1.4.2. Development of a database on field experiments at the European scale

ENDURE partners were asked to complete a survey in order to collect information on field experiment sites and experiments in progress. The objective was to build a database in order to map existing field experiments sites and field experiments in progress among ENDURE partners. It was envisaged that this information could be used to identify networks of field experiments and suggest recommendations to strengthen these networks. These objectives were discussed at the first IA2.2 workshop at Rothamsted in July 2007 (M7).

ENDURE partner sites were mapped and delivered visually via the VL website (Fig. 3) with respect to pedoclimatic data, main activities, experiments in progress, experiment temporal and spatial scales, cultivated crops and pests. We also collected information on long-term experiments in arable crops as part of the process of the initiation of RA2.6. We aim to add to this information regarding datasets from other RAs.

1.4.3. Analysis of field site data

The European diversity of pedoclimatic conditions is well covered by the range of field sites of the ENDURE partners, particularly across Western Europe which is well represented due to the numerous sites from INRA and ACTA. In addition, this diversity is also associated with a diversity of crops studies; although the majority of field sites concern arable crops, some field sites are dedicated to experiments on vegetables (12.5% of sites; mainly Italy and France) and fruit crops (7% of sites; Germany and France).

The main activities at the field sites and the experimental approach with regard to IPM strategies are quite different between partners and countries. Indeed, we can identify two distinct types of experimental activities:

Experiments related to pesticides use.

Testing the efficacy of pesticides or the effect of the reduction of pesticide use on pest control (weeds, diseases and animal pests). These experiments are often implemented using CRBD at different temporal scales. For example, many ACTA or DAAS experiments are located in farmers' fields, annual experiments which move location are the norm. In contrast, at JKI and RRes, which both have experimental farm sites, experiments are done on a longer-term basis in order to study effects of pesticide use reduction and the effectiveness of novel control methods.

Experiments related to the use of one or more alternative crop protection methods.

Experiments concern the test of alternative methods such as biological control of pests, mechanical weeding, or cultivar testing. Again, these experiments can be implemented at different spatial scales. For example, some "classical" experiments are done using a CRBD whilst other experiments are implemented at the field scale using farm scale machinery. Due to spatial scale, this second type of experiment has often fewer replicates than the first one and is mostly used for testing cropping systems.

Experiments of this nature can also be implemented at different temporal scales. Often, annual experiments may focus only on one alternative method or a combination of methods on a specific crop. In contrast, long-term experiments are often related to the comparison of cropping systems (e.g. organic farming vs conventional farming) and aim at studying the effect of crop successions and associated crop management strategies. Long term experiments are also used for perennial crops, such as fruit crops, (e.g. control of soil pathogens), trap cropping, or to evaluate attributes of strategies that may take several years to exert their full effect.

1.4.4. Extension of the database to incorporate other facilities

ENDURE partners were asked to complete a second survey in order to collect information on other (i.e. non-field experiment site) facilities. Again, the objective was to build a database in order integrate facilities across ENDURE partners providing opportunities for collaborative research through sharing of resources and facilities. Replies from partners were collated into a single table which details information on controlled environment facilities (glasshouse/insect rearing facilities/controlled environment rooms and or cabinets), bioimaging facilities, analytical facilities and laboratory facilities. In each case, the database provides a location, brief description of use and a key contact name/email address.

1.4.5. Review process

Similar to resources data, partners will be encouraged to check and/or complete the data already submitted to the VL. All the contributors will be encouraged to review their data in the next few months with respect to possible modifications and improvements in use at the VL review workshop in September. The next step will be to discuss and decide how to highlight important data and how to facilitate the common use of all the facilities in the network.

1.4.6. Search facility

A facility already exists to search on phrases across all of the VL databases. Results of a representative search are shown in Fig. 4.

2. Future actions

2.1. Review workshop

We plan to organise a workshop in September 2008 (M 21) to review all data held within the ENDURE VL. Current database entries will be reviewed and a strategy for forward development and use of the database will be discussed.

2.2. VL implementation

1. Move to ENDURE “Commons” server – remove dependency on RRes server
2. Launch VL and constituent databases on ENDURE website
3. Strengthen links with specific ENDURE activities to focus the evaluation and further development of VL facilities and resources (Development of RA2.6 and the EuroWheat platform provide good examples to follow).

Figure 1. Version 2 of the ENDURE Virtual Laboratory, developed using PHP coding to generate dynamic web pages.



Figure 2. The ENDURE Virtual Laboratory resource collection database

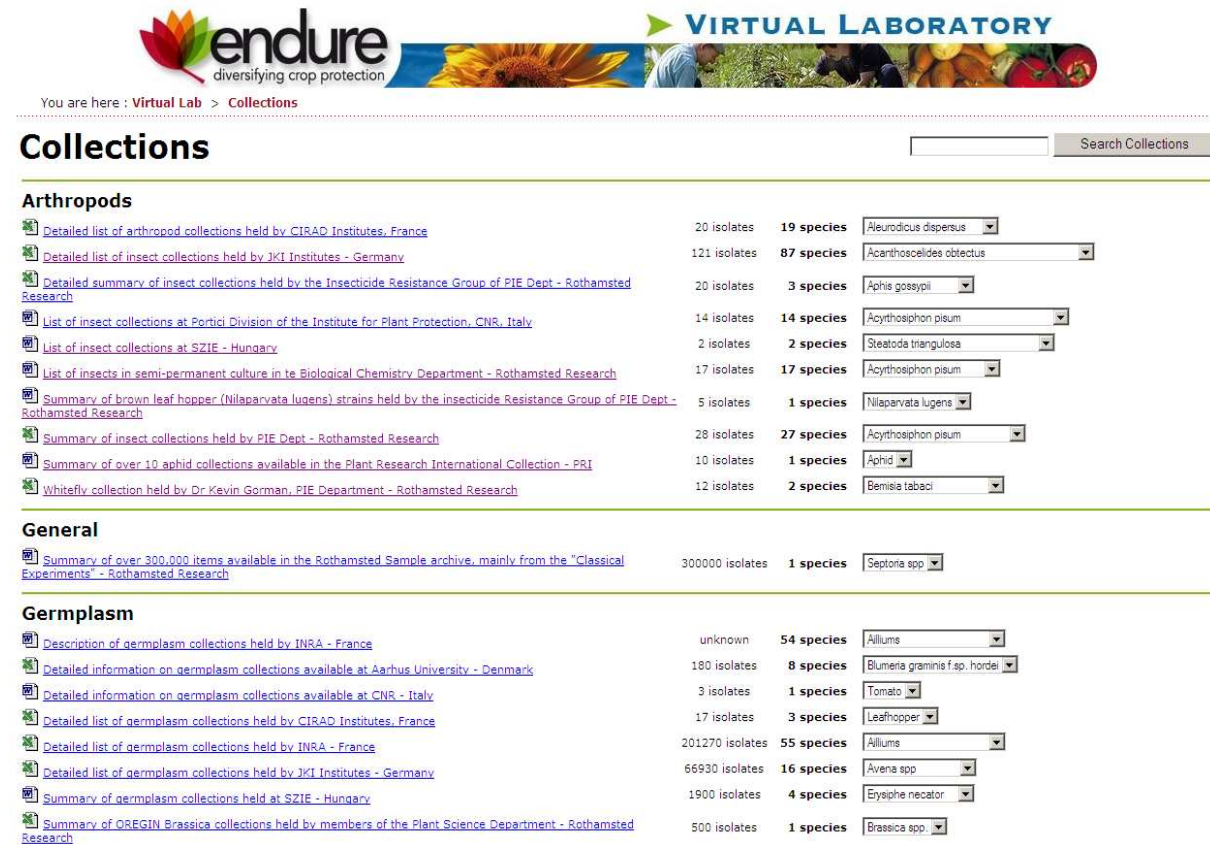


Figure 3. Map-based search of the ENDURE Experimental Field Site database identifying field sites where experiments are done on Winter Wheat.

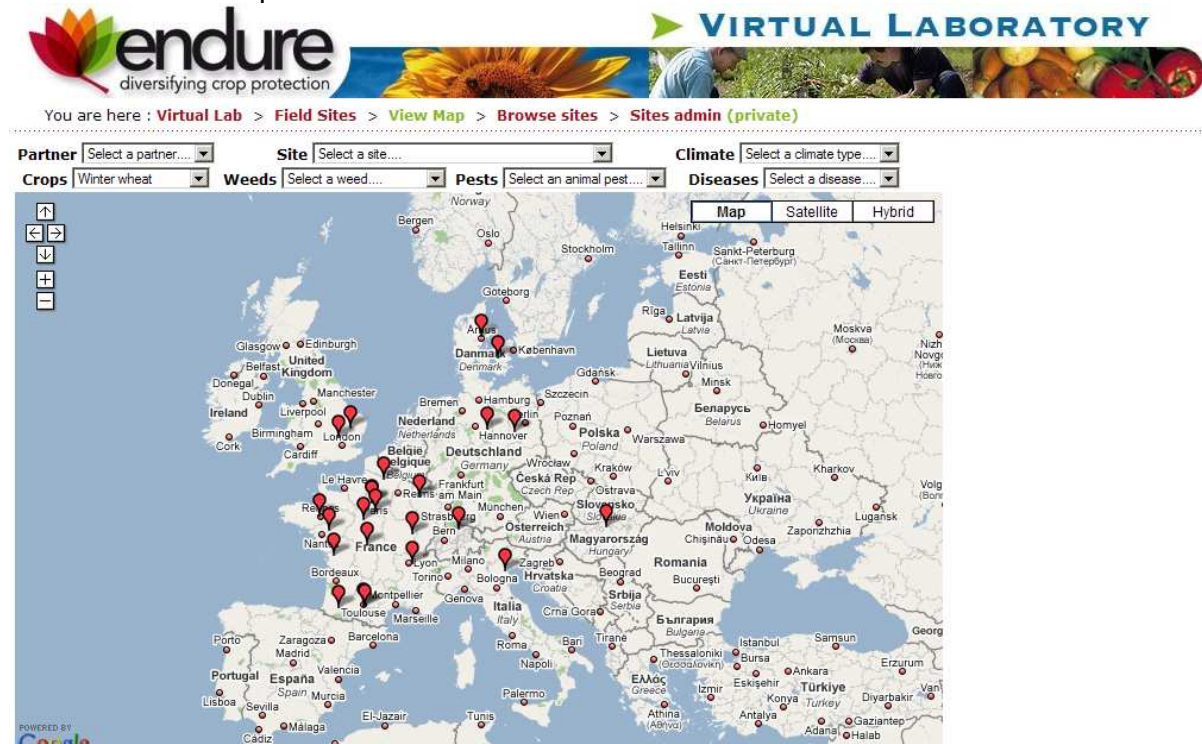


Figure 4. Output from a search for “wheat” within the ENDURE Virtual Laboratory.



3. Appendices

3.1. Appendix 1

Email attachment sent to scientific lead partner (or deputy) to initiate the collection of data on biological resources held by ENDURE partners.



11 October 2007

Dear colleague,

We are making good progress towards the development of the Virtual Laboratory (IA2). However, we have now come to the point where we need input from Partners involved in IA2. Rather than filling in yet another ENDURE questionnaire, we would like you to send a list of the reference collections that you intend to make available to ENDURE. The collections fall into three categories:

- 1 Arthropods, nematodes, weeds or plant pathogens
- 2 DNA/RNA reference libraries)
- 3 Germplasm/crops expressing pest resistance traits.

For each, please indicate the size of the collection and how these are stored. Also, state whether each collection is unique and if not, where other copies of the collection are held. Also, it would be very helpful if you could email (or place on the workspace) examples of database and/or spreadsheets detailing the information fields that you have for each collection. Since we are contracted to assemble a definitive list of available resources by month 12, could I ask you to send details of collections to be made available to ENDURE by 31st October 2007.

I will also post a generic copy of this letter in the IA2.1 area of the ENDURE workspace


With best regards,

Neal Evans
Virtual Laboratory Administrator

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3.2. Appendix 2

Example of data collected in the facilities questionnaire (for the full document, see <http://tinyurl.com/649xw7>)



IA2.2 Facilities questionnaire

1. Listing and mapping of facilities

a. Field experiment facilities

Please, fill the table below concerning the field experiment sites which you wish to share in the network.

Organism:
 IA2.2 representative: Name and SURNAME:
 Address:
 Email:
 Tel: |
 Fax:

Site name	Location ¹	Principal activities	Main crop protection strategies already test	Remarks

¹ Give us enough information in order us to be able to locate the site on a map of Europe

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