



Report on the European Router Database

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Abbreviations

API	Automated programming interfaces
bioC	Directory of Certified Organic Operators
BioFach	Trade fair for organic food and agriculture
CMS	Cytoplasmic male sterility
COP	Committee on Organic Production
CPVO	Community Plant Variety Office
DG AGRI	Directorate General for Agriculture and Rural Development
DG SANTE	Directorate General for Health and Food Safety
EC	European Community
EU	European Union
Euroseed	The European Seed Association
Eurostat	European statistics
FAQ	Frequently asked questions
FiBL	Research Institute of Organic Agriculture
GDPR	General Data Protection Regulation
IFOAM	International Federation of Organic Agriculture Movements
IT	Information technology
RDBMS	Relational database management
REA	Research Executive Agency
SeedLinked	Cultivars testing and evaluation database
SERI	Swiss State Secretariat for Education, Research and Innovation
TIPI	Technology Innovation Platform of IFOAM
US	United States

Executive summary

According to the Farm to Fork strategy of the European Union (EU, 2020), agriculture in Europe shall become more sustainable in the future. By 2030 the use and risk of chemical pesticides shall be halved. Nutrient losses shall be reduced by at least 50 percent while avoiding declining soil fertility and a reduction of fertilizer use by at least 20 percent. Furthermore, the European Union strives to reach 25 percent organic farming area across EU member states by 2030. Furthermore, the new organic Regulation EC No 2018/848 will phase out the use of non-organic seed in organic farming by 2036. For the year 2016, Solfanelli et al. (2019) estimated the supply of organic seed for some major crops to approximately 50 percent across Europe. With increasing organic farming area, as foreseen by the Farm to Fork strategy, the demand for organic seed and by this the need to increase organic seed production will increase several folds. While in some EU member states organic seed supply is increasing, there is still a large lack of organic seed supply in most of the EU member states (Solfanelli et al. , 2019). To increase organic seed production more seed suppliers need to become active and invest in the organic seed and breeding sector (Schäfer, 2020). A lack of transparency of the organic seed market and the frequent authorizations to use non-organic seed are reasons for the lack of investments in the organic seed and breeding sector in the past years (Döring et al. 2012). According to the organic Regulation EC No 834/2007 and its implementation Regulation EC No 889/2008 each EU member state shall provide a national seed database that shows the supply of organic seed in each country. All seed that is not listed in national seed databases is considered as unavailable and constitutes the basis for the authorization to use non-organic seed by organic farmers. A seed supplier and breeder survey revealed, that Europe-wide only approximately 25 percent of all seed suppliers list their organic seed offer in national databases (Schäfer, 2020). Even if seed supplier trade seed to several more countries, seed supply is often only listed in their country-owns national seed database (Schäfer, 2020). The main reasons for this are the administrative burdens and language barriers related to the use of national organic seed databases (Raaijmakers and Schäfer, 2019). To overcome the not transparent organic seed market situation there is an urgent need to improve functionality and quality of national organic seed databases and ease the access to databases Europe-wide (Raaijmakers and Schäfer, 2019). Within the EU Horizon 2020 LIVESEED project an EU router database has been programmed that aims to give access for seed suppliers to all 28 EU member states and Switzerland national organic databases with one single login. The general concept of the EU router database has been developed with the support and expertise of actors of the organic seed sector across Europe. By August 2017 a catalogue of basic requirements has been developed that describes the basic needs to be fulfilled by a Europe-wide database. From October 2017 to September 2020 the programming of the database has been conducted. The concept of the EU router database has been presented and discussed at various events and meetings to actors of the organic seed sector.

The EU router database is designed as a back-end database that allows information exchange between seed suppliers and representatives of national competent authorities. To reduce language barriers, the database will be available in 22 EU member state languages. Seed suppliers can register in the database and offer certified organic seed, in-conversion organic seed, vegetative organic propagating material, or organic heterogeneous material to all EU member states and Switzerland. Based on the provided seed supply information, representatives of EU member states shall revise the requested seed offer directly in the EU router database. If the information for revision is not sufficient, the database offers a communication tool to improve knowledge exchange between seed suppliers and representatives of authorities. All offers that are considered as suitable and marketable by an authority shall be accepted and displayed in national organic seed databases. Information flow from the EU router database to national databases is organized either via automated programming interfaces (APIs) or manually via data downloads. Seed suppliers will be able to add various attributes to describe their offered organic seed. Additionally, the EU router database offers voluntarily to seed



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supplier and breeder to indicate in the system varieties that have not been derived by cell fusion which is banned by several private organic labels. Thus, national authorities can forward this information to their national databases to allow farmers the right choice of varieties.

The databases front page offers a platform to display information relevant for actors in the organic seed and breeding sector. This includes links to national seed databases, regulations on organic seed production, trade, and use. Furthermore, it will be possible to search for contact addresses of seed suppliers and the species in which they offer organic seed, in-conversion seed, organic vegetative propagating material, or organic heterogeneous material. Additionally, the databases offers a large long-term potential to constitute a data repository for the organic seed and breeding sector. For instance, national derogation reports on the use of non-organic seed and reports on crops for which no derogation or a general derogation applies. Furthermore, data on field testing results of varieties and areas of organic seed production per crop could be published. With all these features the EU router data base will contribute largely to improve transparency of the organic seed market across the different EU member states.

To maintain the database in the future beyond the lifetime of LIVESEED a financing concept needs to be implemented. There are different options for how the database could be maintained and financed. Financing could be organized either via the support of seed suppliers, by funds supported by national competent authorities, or by European funds. Financing via seed supplier would require a fee paid by each seed supplier for the use of the database. However, the new organic Regulation EC No 2018/848 states that the entry of seed offer into databases shall be free of charge for organic seed suppliers. National competent authorities are already required to maintain national seed databases; thus it will be difficult to receive funds from EU member states. The Directorate General for Agriculture and Rural Development (DG AGRI) of the European Commission has shown interest in the new EU router database to support further mobilization of EU funds to finance the database in the future. Besides a reliable financing strategy, it is of outstanding importance to gain a high uptake of the database by actors of the organic seed supply chain and national authority representatives. To ensure dissemination and fast adoption the database has been presented and discussed at various events including meetings with DG AGRI and a presentation at the Committee on Organic Production (COP) in Brussels in October 2019.



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1 Introduction

The use of organic seed is a fundamental principle in organic farming. However, until the first European wide organic regulation was introduced in 1991, the use of organic seed was declared in the guidelines of private farming associations. Through the introduction of the organic Regulation EC No 2092/91, which came into force on January 1, 1992, it was from now on Europe wide mandatory to use organic seed if available. The implementation of the regulation differed among the EU member states, as the term “available” was not defined in the Regulation. The amendment Regulation EC No 1452/2003, which came into force on January 1, 2004, addressed this issue and the term “availability of organic seed” was defined. The establishment of national databases to list all offered organic seed and seed potatoes became mandatory for all EU member states. The Regulation defined that only organic seed that is listed in national organic seed databases shall be considered as available. Regulation EC No 834/2007 set aside the former Regulations and its implementation Regulation EC No 889/2008, and in particular article 48, describes the requirements of the national organic seed databases in detail. Any organic seed offer which has not been registered in the national organic seed databases shall be considered as “unavailable” and derogations on the use of untreated, conventional seed are given. Therefore, it is important to list all available seed offers on the national organic seed databases as these offers constitute the basis for authorization to use non-organic seed.

Within the LIVESEED project, the project team revealed manifold reasons why national organic seed databases remain incomplete or nearly empty, even if organic seed is available to a certain extent in a country. Stakeholders from different EU countries reported that this could be due to complicated procedures for seed supplier to upload their seed offer to some national databases. Furthermore, in a stakeholder workshop conducted by the European Consortium of Organic Plant Breeding, it was mentioned that databases are not updated frequently enough to indicate the real supply situation (ECO-PB, 2013). Suppliers stated that if there is almost no demand of organic seed through the database, they do not see benefits in uploading their seed offer to the national databases (Raaijmakers et al., 2019a). A synopsis of EU member states’ databases showed that the quality and implementation level of national organic seed databases differs between EU countries (Solfanelli et al., 2019). Some databases are very advanced and offer several features such as real-time updating, different quick search options, online-derogation request forms, additional information on seed quality and suitability of cultivars for certain production regions/methods, history functions on available offers in the past, updates on selected crops, and many more. While other national databases remain at basic level implemented as static files such as PDF or Excel sheets. Some national organic seed databases are hard to find if no static links are provided which may cause outdated links (Raaijmakers and Schäfer, 2019). The frequency of updating databases differs between real-time, to weekly, monthly or even twice a year. Data management can be done by either the national seed database manager or by the seed suppliers themselves (Solfanelli et al., 2019).

A seed supplier and breeder survey conducted within the LIVESEED project revealed that if seed supplier list seed offer in national databases, they mainly operate in their own country’s national seed database, even though they trade organic seed in various other EU countries (Schäfer, 2020a). Main reasons for using country-own national seed databases only refer to language barriers and administrative burdens (Schäfer, 2020a). Many national organic seed databases are available in their national language only. Administrative burdens have been reported for example that in some EU member states listing in national database is only possible if the supplier has a national address and is controlled by a national control body (Raaijmakers and Schäfer, 2019). Furthermore, different levels of the organic regulation implementation among the EU Member states lead to trade barriers and hamper administrative procedures for companies if they operate in several European countries (Döring et al., 2012). Seed supplier claimed to face disproportional administrative work if they need to update their organic seed offer in up to 28 national organic seed databases (one in each EU Member



State) (Raaijmakers et al 2019b). In 2009, the European Commission estimated that approximately 32 percent of companies' administrative costs for adhering EU laws are caused by inefficient implementation rather than the legislation itself (European Commission 2009). In 2012, the Board of the Swedish Industry and Commerce for Better Regulation and the Swedish Better Regulation Council published a report about the different levels of implementation of European regulations between EU member states and how this leads to increased costs, unnecessary regulatory burdens and competitive disadvantages for business and ultimately impede the growth of a sector. One main recommendation of the report is the consultation of stakeholders before implementing a regulation as well as not taking (full) advantage of any derogations (Board of Swedish Industry and Commerce for Better Regulation 2012). Transferring these recommendations to the implementation of the organic regulation on organic seed in the EU, the establishment of national organic seed expert groups (as already implemented in nine European countries¹) and a reduction of administrative burden for seed supplier to upload their seed offer to national organic seed databases would be favourable.

However, if national databases remain empty or nearly empty, derogations for the use of untreated, conventional seed are granted frequently by the competent authorities. Döring et al. (2012) state that the frequent use of conventional seed impedes the development of the organic seed market and thus leads to less investments in the organic seed sector. Furthermore, it hampers the development of a level-playing field across Europe. Organic farmers face national differentiating derogation rules on the use of conventional untreated seed in organic farming which often leads to competing market prices between EU countries. While organic seed supply is limited in some European countries, there is a growing supply of organic seed in other countries. There are international organic seed suppliers who offer a broad range of cultivars that grow in many European countries. Many of these suppliers are active in several EU countries, but in most cases, they do not list their seed supply in national organic seed databases (Schäfer, 2020a). Currently, the availability of organic seed, and thus the basis for authorization to use non-organic seed is implemented at national level (Article 48 of EC No 889/2008), disregarding the availability of organic seed in a neighbouring country. The new organic regulation 2018/848 pursues the authorization of non-organic seed "at national level" but also includes the suitability of an organic seed offer according to pedo-climatic regions. Pedo-climatic zoning derives from several layers in which the climatic and environmental stratification is combined with pedological stratification and potential crop growth stratification (DLO-Alterra Wageningen UR 2011). Tóth et al 2017 developed within the EU Framework Programme for Research and Innovation Horizon 2020: SFS-4-2014 Soil quality and function the project "Interactive Soil Quality Assessment in Europe and China for Agricultural Productivity and Environmental Resilience" a hierarchical and multi-scale pedoclimatic zonation of Europe (Figure 1). In general, the introduction of pedo-climatic regions allows to better govern site adapted Action Programs within the EU as it has been used for "Recommendations for establishing Action Programmes under Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources" (DLO-Alterra Wageningen UR, 2011). Regarding the authorization of non-organic seed according to pedo-climatic regions allows a more transnational examination of the availability of organic seed offer and thus provide a more level playing field for farmers. Döring et al. (2012) see a good potential for a European seed database as this would encourage the use of organic seed from similar pedo-climatic regions across Europe and increase the competitiveness of the organic seed sector.

Within the LIVESEED project, a newly programmed EU router database has been developed. The aim of the EU router database is to significantly lower the administrative burdens for organic seed suppliers and to allow access to national organic seed databases. With one single login seed supplier shall be able to manage their offer in all EU member states. This shall increase the transparency on available organic seed offer within the EU and create a level playing field on organic seed trade. The

¹ Belgium, Denmark, France, Germany, Italy, Latvia, the Netherlands, Sweden and Switzerland.



new EU router database shall provide a knowledge platform and data repository for seed supplier and national and regional authorities. Furthermore, the database aims to create direct links between seed supplier and national authorities and thereby filling information gaps.

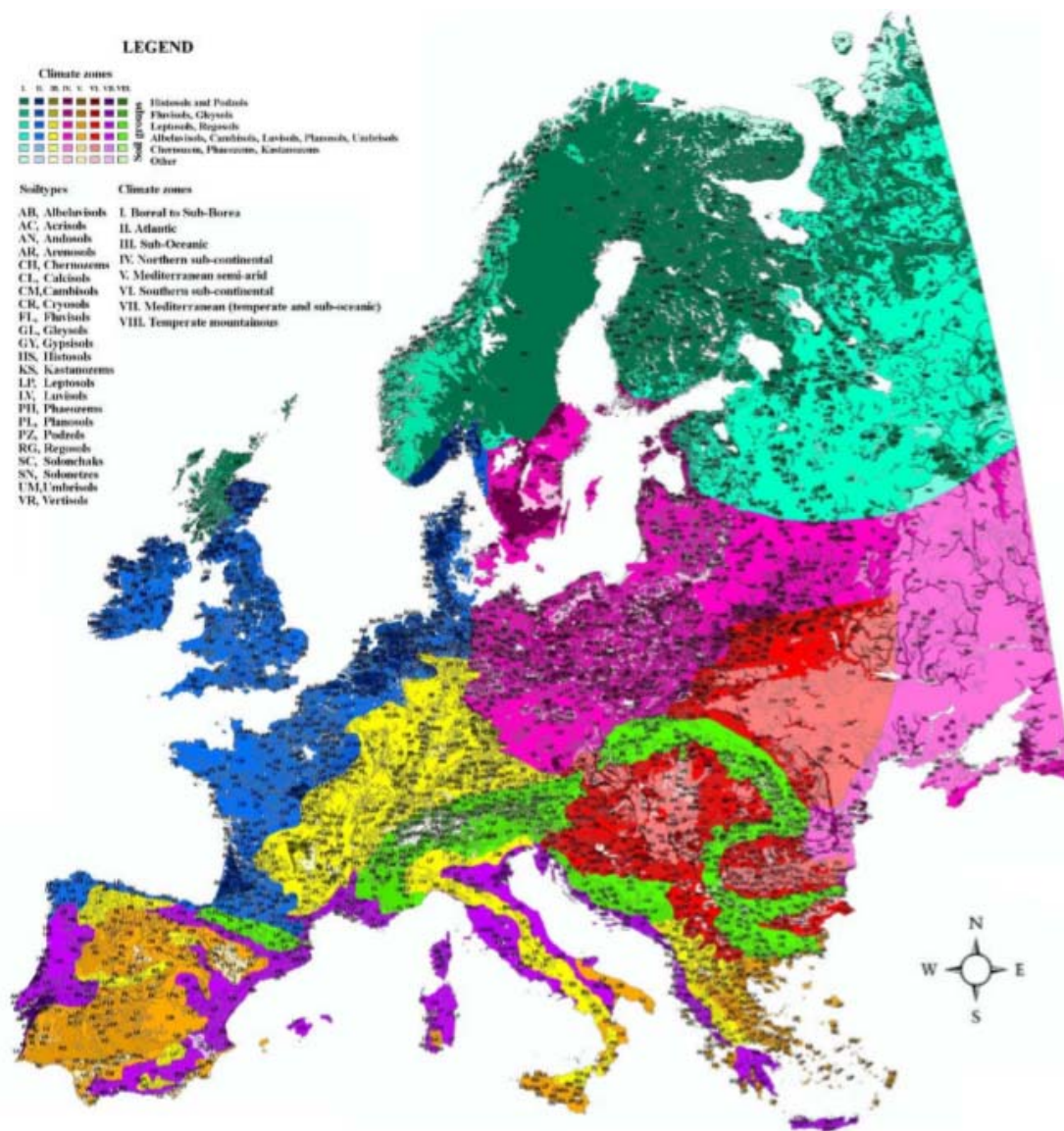


Figure 1. Hierarchical and multi-scale pedoclimatic zonation of Europe by Tóth et al., 2017

2 General concept of the European router database

As described in Figure 2. Flow chart of the EU router database. Blue arrows indicate seed offer uploads performed by the seed supplier; red arrows indicate offer rejected by the competent authority; green arrow indicated offer accepted by the competent authority with a data output into national organic seed database (via Automated Programming Entry API or manually). Farmer and control body check the availability of organic seed in national databases. If no appropriate seed is available, farmer can request a derogation for the use of non-organic seed., the general concept of the router database is designed as a back-end database in which information exchange takes place between organic seed supplier and designated representatives of national authorities. Registered seed supplier can upload

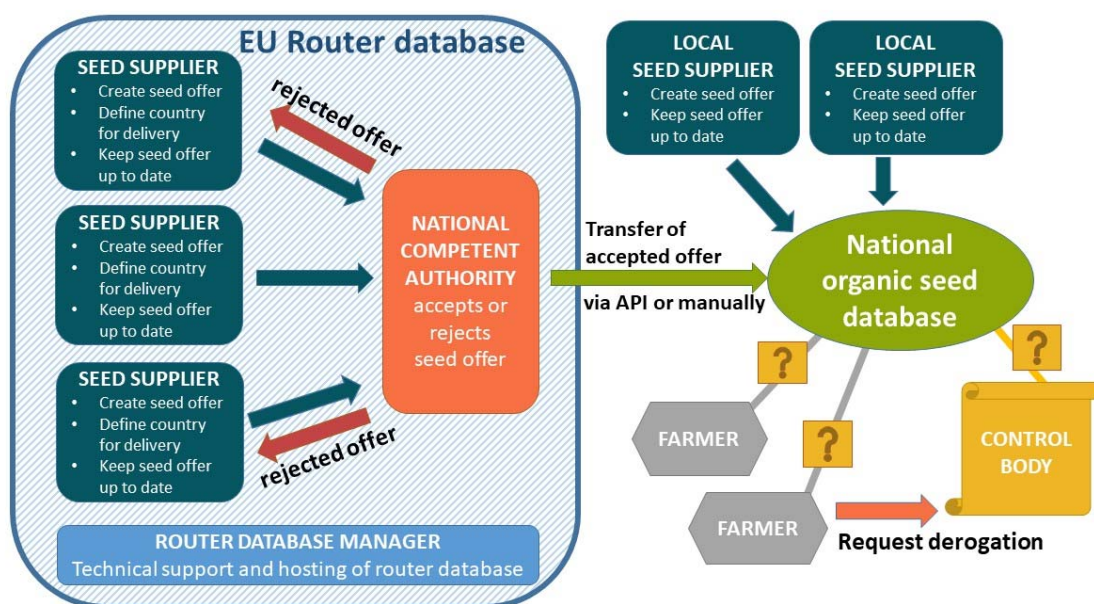


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information on their available organic seed offer and indicate in which country this offer can be supplied. If a seed supplier requests to display a seed offer in a national database, the corresponding authority will receive an automated notification in the EU router database to revise the information provided by seed supplier. Revising of organic seed offer shall be conducted based on provided information in the database. If relevant information for organic seed offer revising is missing, authorities may request via the router database further information from the seed supplier. Thus, competent authorities can ensure that the offer on the national database are adapted to the country's needs and also that it complies with specific national requirements. Accepted offers shall be displayed without delay in national organic seed databases. Information flow from the EU router database to national organic seed databases can be ensured via automated programming interfaces (APIs)² or manually via data downloads (.csv files) and uploads to national organic seed databases. Nevertheless, seed suppliers will still keep the possibility to report their seed offer directly to a national database manager. It will not be obligatory for any seed supplier to use the EU router database.

Based on the above described general concept, the EU router database shall serve as a facilitator of knowledge exchange between organic seed supplier and representatives of national authorities. To ensure appropriate revision of the seed offers, representatives of national authorities should be knowledgeable on suitability of varieties in organic farming, for example work for the seed authority, manage the national organic seed database or are member of national seed expert groups.

However, all current national organic seed databases will remain as a single point of contact for farmers and control bodies to get information on the organic seed supply in its territory. The displaying of available seed offer, which constitutes the basis for the authorization for the use of non-organic seed shall remain at national level. Thus, the concept of EU router database respects and complies with the organic seed Regulation EC No 834/2007 and its implementation Regulation EC No 889/2008, as well as the Regulation EC No 2018/848 by respecting national organic seed databases as legal information points for farmers and control bodies for the use of non-organic seed in organic farming.



² An automated programming interface (API) is a computing interface which defines interactions between multiple software intermediaries. The router database provides continuously, at least every 24 hours, all available data to APIs at national level. Data output is pre-defined in data set that include for example crop group, latin species name, name of cultivar, seed quality, country of delivery, delivery information, available quantity, ...



Figure 2. Flow chart of the EU router database. Blue arrows indicate seed offer uploads performed by the seed supplier; red arrows indicate offer rejected by the competent authority; green arrow indicated offer accepted by the competent authority with a data output into national organic seed database (via Automated Programming Entry API or manually). Farmer and control body check the availability of organic seed in national databases. If no appropriate seed is available, farmer can request a derogation for the use of non-organic seed.

To increase transparency and dissemination, the EU router database provides a platform to implement a data repository for the organic seed and breeding sector in Europe. This open-to public website offers information on registered seed supplier, links to national organic seed databases, organic production Regulations, as well as information to relevant public-funded projects in the organic seed and breeding sector. Additionally, the platform could be used to display information on organic cultivars, smart practises implemented at national level, national derogation reports and species or sub-species for which general or no derogation will apply. According to the new Regulation EC No 2018/848 member states will need to yearly report to the European Commission all species or sub-species for which general derogations and no derogations will apply.

Continuous data collection of all seed offers entered to the EU router database and the decision of authorities allows the implementation of monitoring schemes and statistical evaluation for reports to the European Commission on activities and changes conducted in the EU router database.

The router database will be available in 22 languages: Bulgarian, Croatian, Czech, Danish, Dutch, English, Estonian, Finnish, French, German, Greek, Hungarian, Italian, Latvian, Lithuanian, Polish, Portuguese, Romanian, Swedish, Slovak, Slovenian, and Spanish. National authorities will automatically be linked with their country's language while seed supplier can choose which language they prefer. The identification of a specific crop beyond the special national name(s) is its Latin name. This ensures that seed supplier and competent authorities from different countries communicate about the same crops and there is no language barrier. For all registered varieties, there is an associated history, so it is transparent from when until when a certain cultivar was offered and by which supplier.

Additionally, the database offers a feature that allows to collect and display information if a variety or cultivar has derived from a cell-fusion free breeding method. Organic farming aims to preserve the integrity of the plants and respect crossing barriers in breeding. The use of varieties that have been derived from cell fusion like certain cytoplasmic male sterile (CMS) F1 hybrids of broccoli and cauliflower is therefore controversial in organic farming. The biodynamic farming associations Demeter and several further private organic farming associations in Germany, Austria and Switzerland reject this breeding technique (FiBL, 2020). However, due to breeder's business secrets, the information provided by a breeder on the breeding method still remains on voluntary basis which created large information gaps in the past. Within the LIVESEED project a working group has collected information on vegetable hybrids that have not been bred by cell fusion. A list of available varieties of cabbage, chicory, radicchio types and sugar loaf that are not based on CMS derived by cell fusion has been published by FiBL in the languages English, French, German, Italian and Spanish (FiBL, 2020). However, this list needs to be further completed and updated. The EU router database offers on a voluntary basis to seed supplier and breeder to indicate in the system varieties that are not based on CMS derived by cell fusion. Thus, it becomes transparent for national authorities if a variety derived from cell-fusion free breeding and can transfer this information to their national farmers.

3 Development and implementation of the European router database

Within the LIVESEED project, various stakeholders such as organic seed supplier, breeder, seed certification offices, seed associations, control bodies, national and regional authorities as well as non-



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governmental organisations have been contacted to assess the basic requirements for the implementation of the EU router database. The basic requirements and the programming of the database have been discussed with programming experts from IT companies. Resulting from the consultation of stakeholders from the organic seed sector and programming experts, the Milestone 1.5 of basic requirements on the EU router database has been completed by August 2017. The IT Company Blitz GmbH has been sub-contracted by FiBL Germany to program and implement the database. From August 2017 on, programming by the IT Company has started. The programming was conducted in regular exchange between the IT Company Blitz GmbH and FiBL Germany. Testing of newly programmed features was first conducted internally by FiBL Germany, before further testing was conducted by external experts, such as seed companies or national authorities. The database has been programmed in the programming language PHP (version 7.0). PHP is a general-purpose scripting language especially suited to web development (PHP, 2020). The data is stored on a MySQL server located in Germany and complies with the General Data Protection Regulation (GDPR). MySQL is an open-source relational database management system (RDBMS). A relational database organizes data into one or more data tables in which data types may be related to each other; these relations help structure the data. SQL is a language programmers use to create, modify and extract data from the relational database, as well as control user access to the database. In addition to relational databases and SQL, an RDBMS like MySQL works with an operating system to implement a relational database in a computer's storage system, manages users, allows for network access and facilitates testing database integrity and creation of backups (Wikipedia, 2020).

3.1 Stakeholder consultation

To disseminate the general concept as well as receiving valuable feedback to improve implementation, the router database was presented and discussed at several public, semi-public or closed occasions during the LIVESEED project.

- Meeting with Euroseed (European Seed Association) on 6th October 2017, Euroseed office Brussels;
- In Bulgaria, Greece, Hungary, Italy, Latvia, Poland, Romania, Spain at national LIVESEED workshops in which the improved implementation of the EU organic regulation on organic seed use was discussed.
- The 2nd annual meeting of LIVESEED on May 2019, Poland;
- A meeting with the REA, DG SANTE, DG AGRI on the 12th June 2019 in Brussels (the detailed concept of the EU router database, the programming process, the pilot phase as well as an outline how the longevity of the database can be assured was discussed);
- On 19-20 June 2019 at the European Organic Congress and the IFOAM EU Council;
- At the Committee on Organic Production (COP) meeting 15th Oct 2019 in Brussels. A second meeting of the COP was planned in March/April 2020 where FiBL Germany was invited again to present the second version of the Router Database, was postponed to later in 2020;
- At a national workshop in Lithuania in August 2019;
- At a meeting at the CPVO-Examination office on 4th Dec 2019, Angers;
- At the joint policy meeting of LIVESEED, BRESOV, ECOBREED projects and DG AGRI and DG SANTE in Brussel 23rd January 2020;
- On 29th January 2020 at the Hungarian seed expert group meeting in Budapest;
- At a LIVESEED workshop on the new organic Regulation at BioFach, on 13th Feb 2020;



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- The 3rd Annual meeting of LIVESEED on 15th April 2020 where the seed suppliers' and competent authorities' account pages were presented and discussed in detail with project partners.
- On June 25-26 2020 at the international LIVESEED workshop on implementation of the Regulations on organic seed in the North-Western EU countries. Invited countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxemburg, Netherlands, Norway, Sweden, Switzerland and United Kingdom.

Furthermore, individual meetings, e-mail contacts and phone calls have been conducted with several seed suppliers. The LIVESEED partners and organic seed supplier/breeder Freudenberger Feldsaaten, Vitalis, Bingenheimer Saatgut AG and Sativa Rheinau have been involved more often.

3.2 Beta-testing and launch of the European router database

The official beta-testing phase has started in July 2020. The testing server can be reached via the link <https://c01.oxsdemo.fiblprojekt.de/rdb>. The testing languages are English and German. Designated representatives of national authorities receive login contacts directly from FiBL Germany to start their testing activity. Organic seed supplier can create their own login at the testing server. All national authorities and more than 50 organic seed suppliers have been invited to test the router database. Furthermore, all actors of the LIVESEED stakeholder platform (about 150 actors) as well as all LIVESEED partners have been informed and invited to participate in the testing phase. User guides for seed supplier and national authorities have been provided to the testing persons. The testing phase focused on usability, functionality and further potential of the database. Seed supplier and national authorities were asked to give feedback via an Excel file template. To test for usability, respondents were asked if they experience any difficulties in using the database. To test for functionality, respondents were asked to test the different functionalities and give feedback if any difficulties arise. Furthermore, respondents were asked from their point of view what potential use in future they see for the router database. Within the period of July to September 2020, 14 seed supplier and two national authorities tested the database. The supplier and authorities gave valuable feedback mainly on usability and functionality from the testing activities. Regarding the long-term potential use only little feedback was given. Feedbacks were discussed with the IT company Blitz and implemented to improve the functioning and usability of the router database.

By the end of October 2020, the beta-testing phase will be closed. Transferring the database from the testing server to the final commercial server will be conducted in November 2020. The official launch of the EU router database has been foreseen at the LIVESEED final conference for stakeholders and policy makers on 24 November 2020 and the European workshop on 25 November 2020. Translation of the router database into all EU languages will be conducted from October 2020 to April 2021.

3.3 Automated programming interfaces to national organic seed databases

Automated programming interfaces (API) ensure a sound information flow from the EU router database to national organic seed databases. During the programming phase of the router database FiBL Germany has contacted various national authorities to discuss the possibility to implement APIs. France and Italy have signalled interest in elaborating APIs between the router database and their national organic seed databases. FiBL Projekte GmbH, the service provider of OrganicXseeds.com, agreed to implement APIs to all national organic seed databases that are using the software tool OrganicXseeds. OrganicXseeds is a service tool of national organic seed databases. The tool is programmed on a modular system which can be adapted to individual national requirements. By September 2020, the countries Belgium, Denmark, Germany, Ireland, Luxemburg, Sweden, Switzerland and United Kingdom are using the software OrganicXseeds as their official national organic seed database. Thus, the above-mentioned countries and all countries which will take over



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OrganicXseeds in future will be connected to the EU router database via an API. Within the timeframe of the LIVESEED project (until May 2021) further programming of APIs to national databases will be possible through the programming budget. The financing strategy of the EU router database beyond the LIVESEED project is described and discussed in paragraph 5 and 6.



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4 Features and functionalities of the European router database

The EU router database offers three kinds of user accounts and information for external user that are visitors without any login data. The users are: organic seed supplier, national authorities or their representatives and the database manager of the EU router database, which is known as administrator. Figure 3 describes the information flow within the router database. Orange arrows indicate information provided by the supplier to the different users. Green arrows indicate information provided by national authorities to the different users. Blue arrows indicate information provided by the administrator to the different users. Organic seed supplier needs to provide contact data information to national authorities and the administrator. User without any login can just retrieve the supplier's main contact address and the list of countries and crops in which organic seed or vegetative propagation material is supplied by a specific supplier. Information at variety level (including all details such as the kind of seed, seed quality, available quantity, breeding method, and so on) are just visible for national authorities and the administrator. Farmers, farm advisor, control bodies and researcher need to visit their national database to get specific organic seed offer information. This shall assure that national seed databases are still visited and used by farmers to check the national availability of organic seed offers before requesting a derogation for the use of non-organic seed or vegetative propagating material. Contact data provided by national authorities will be visible for seed supplier and the administrator. Contact data of the administrator including the contact to the help-desk will be visible for all users (seed supplier, national authorities and external users). All information of seed offer will be visible for the administrator. While national authorities will only see offers that are intended for their country. The decisions on seed offer made by national authorities are visible to the corresponding seed supplier and the administrator.

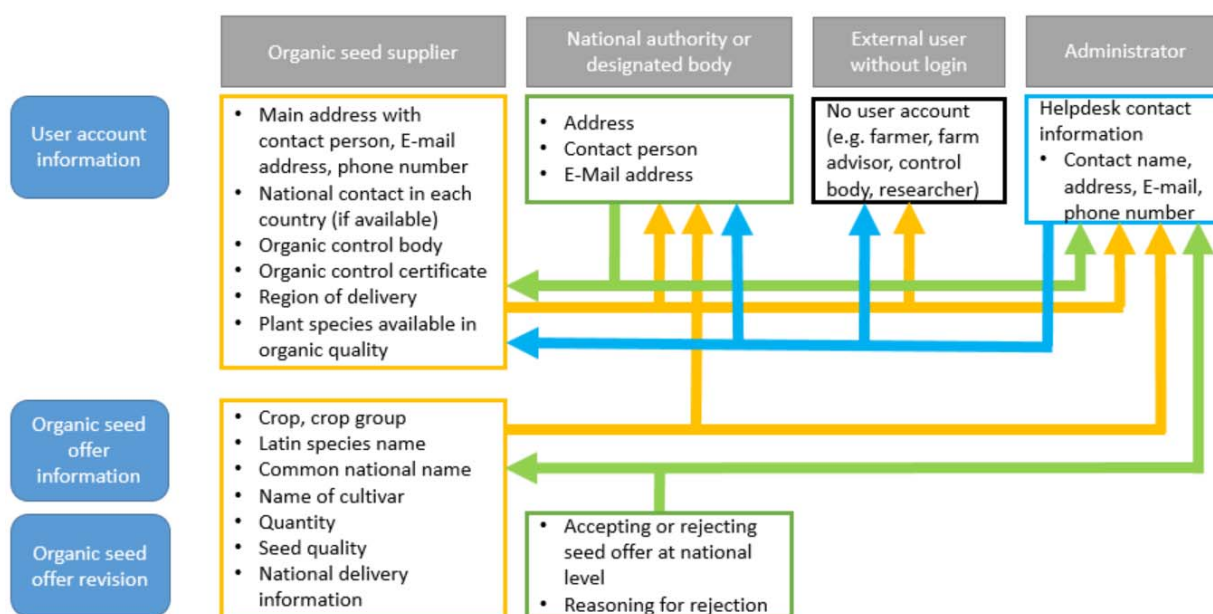


Figure 3. Information flow between different users within the router database.



4.1 The databases front page

4.1.1 Home

On the front page of the EU router database, the visitor can find information about the functions the database offers to the different users including the general concept and legal framework. Language settings, GDPR (General Data Protection Regulation) compliance, site content, user guides, frequently asked questions, funding information and the contact to the helpdesk will be displayed. Furthermore, links to all national databases of all EU-countries and Switzerland will be implemented. Additionally, links will be provided to projects in the organic seed and breeding sector, relevant publications, regulations and official documents.

All information, links, documents and texts can be easily changed by the administrator, if necessary. Table 1 illustrates all menu points including their content and detailed descriptions of the databases frontpage.

4.1.2 Search for organic seed supplier and crops

In the search function it is possible to search for seed supplier and their crop offers provided from certified organic quality to European countries and Switzerland. Note: This search function will only show the seed supplier and crop offers that are registered through the router database. The national databases may display even more offers and supplier.

Visitors have to choose a country to get a list of all suppliers that are currently listing offers in the corresponding country. For each supplier, the offered crops will be displayed. Optionally, it is possible to filter for a certain supplier or a certain crop in a country. In the public search function, the availability of a certain cultivar will not be displayed. Availability needs to be retrieved via the national seed databases. This is due to the fact that some seed companies regard the national availability of a certain cultivar or variety as internal business secrets and thus are hesitant to publicly display this information in one website where the information can directly be compared.

4.1.3 Register as organic seed supplier

The EU router database is open to all seed suppliers who offer organic seed, organic seed mixtures, organic heterogeneous material, organic vegetative propagating material or in-conversion seed and vegetative propagating material. All seed suppliers can offer their supply in any EU member state and Switzerland through the router database in one of the available languages. There is no limitation to crops or species that can be offered in certified organic quality. The organic seed production must comply with the organic Regulation EC No 834/2007 and its implementation Regulation EC No 889/2008. The new organic Regulation EC No 2018/848 will set apart the former Regulations and organic seed production and trading must comply with the new organic Regulation. Also, seed suppliers from outside the European Union are welcomed to publish their certified organic seed, in-conversion seed and propagating material supply if they deliver the seed to an EU member state or Switzerland.

To register as an organic seed supplier, it is necessary to fill the provided form under **register as organic seed supplier**. The seed supplier needs to sign a contract with the administrator which proves that the company is certified by an official control body to sell certified organic seed. In the contract, the seed supplier assures the availability of the offered seed in the database and indicates for which countries the seed is recommended. This will be carefully managed and regularly updated. In case the seed supplier violates the contract conditions, there will be consequences up until the deactivation of the supplier's account and exclusion from the database.



4.1.4 Login to accounts

There are logins possible for either seed suppliers that have registered themselves as described above, as well as for all national authorities of the EU countries and Switzerland. The authorities will receive their login details from the administrator. For logging in each user will have an individual username and password and a linked e-mail address.

4.1.5 Forgotten password

If a user has forgotten his password, it is possible to reset the password via a link. The user has to provide his username and linked mail address. An e-mail will be sent to this address and the user can choose a new password. According to the general data protection regulation (GDPR), the administrator has no insight into passwords and is not able to re-set a password.

Table 1. Table of menu points at the front-page including content provided and detailed description

Menu point	Content provided	Detailed description
Home	Introduction text	All needed background information about the router database.
	Funding information	Router database was funded within the Horizon 2020 project LIVESEED. The LIVESEED project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727230 and by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 17.00090. The information contained in this communication only reflects the author's view. Neither the Research Executive Agency nor SERI is responsible for any use that may be made of the information provided.
	Contact information to helpdesk and administrator	Mail address and phone number to answer questions.
	Guides and FAQ	Download of the user guides and collection of FAQs.
	Links and documents	Links and documents to regulations, official documents, national databases, EU commissions homepage, projects and relevant publications in the organic seed and breeding sector.
Login to accounts	National authority or their representative account	Login to get access to further functions.
	Seed supplier account	Login to get access to further functions.
	Administrator account	Login to get access to further functions.
Forgotten password	Re-setting of a password	Reset password via a link.
	Country	List of all EU member states and Switzerland



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Search for organic seed supplier	Name of supplier	Drop-down menu of in the database registered seed supplier
	Species	Drop-down menu of species provided by seed supplier in the database
Register as organic seed supplier	Address of the contractor	Name of the company*; Annex name; Street*; Postcode*; PO Box; PO Box; Postcode*; City*; City annex; Country*; Phone number*; Phone number 2; Fax; E-mail-address*; Webpage
	Login data	Username*; User password*; Repeat password*; E-mail-address*; Repeat E-mail-address*

* Mandatory to register as seed supplier

4.1 Organic seed supplier account

Through the EU router database registered seed supplier can supply certified organic seed and propagation material to all EU member states and Switzerland. The national competent authorities have the right to accept or reject an offer and the seed supplier will receive feedback on whether the seed is accepted or rejected. By offering seeds in a certain country the supplier guarantees that he has an office, qualified trader or is able to ship the seed to this country and that the cultivar can be grown successfully in this country. Some member state authorities may request the supplier to offer variety information at least in English or in their national language. Thus, national farmers can get information on new varieties. In case of an unclear situation on suitability of a variety, seed supplier can be requested by a national competent authority to prove that seeds of a cultivar offered to a national database are adapted/suitable for this country. This can be proven either through providing cultivar testing protocols, reports of cultivar tests conducted in the country or if some farmers are already successfully growing this cultivar in the country, for instance he can prove that the supplier already sells the cultivar to national farmers. If a supplier lacks a national trader or marketing channel a “wholesale level” functionality will allow to inform an authority that this supplier could supply organic seed, in-conversion seed or vegetative propagating material to a certain country but lacks a national contact point. This shall create transparency and ease foreign market accessibility. Table 2 illustrates all menu points in the organic seed suppliers’ account including content provided and detailed description.

4.1.1 My account/country management

Seed supplier can manage their login details, address information, contact details, operating countries and logo.

Country management: The country management allows to edit contact information and office addresses for the countries and their delivery area in which organic seed or propagation material can be supplied to. To become active in a new country via the router database, seed supplier can request to offer seed in a certain country. The corresponding authority will receive a notification to accept or reject seed supplier for their country. The status of the national authority’s decision will be forwarded to the supplier. To provide national contact points to farmers, seed supplier can add national contact data to be displayed in a national database.

Certification: Seed supplier need to provide their organic control number and organic control body and upload a copy of his organic certification. There will be a search for this number via bioC (www.bioc.info). BioC GmbH is an initiative of organic certification bodies, associations in the organic



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food sector, service providers and IFOAM-Organics International. BioC GmbH aims the global availability of verified up to date certification information.

4.1.2 My offers

Seed supplier will be able to manage their seed offers. Via the function “open all” all information on countries of all offers are displayed. Alternatively offers can be revised one by one. Filtering is possible for cultivar name, species, if offers are available at the moment or not, if offers are accepted by country authority or not for offers in a certain country. If data transfer to national databases is organized via APIs changes in supply will be automatically displayed in national databases.

Next to the cultivar details, national specific supply information, such as national availability and status of acceptance, is displayed. Additional delivery information on national or regional level as well as the available quantity can be set for each seed offer and country.

Status of supply can be set to “green - available”, “red - not available” or “archive - this cultivar is not offered by the supplier anymore”. Via the **history** function all changes of a seed offer are tracked, this includes the availability, decisions of the competent authority and change regarding information of organic control. Information on cell-fusion free breeding methods can be displayed for each cultivar. The router database offers the possibility that seed supplier or breeder can give an assurance that a cultivar derived from cell-fusion free breeding methods. Via **edit master data** amendments to the kind of seed, the seed quality and certification association can be updated.

4.1.3 Offer tracking

At offer tracking, supplier can follow the recent history, changes and decisions regarding seed offers. A search is possible for certain varieties/cultivars or in a certain country or for a certain time range.

4.1.4 Add new offer

Before offering a new variety, supplier need to check if the variety already exists in the database. The **variety search** offers the possibility to search for certain varieties/ cultivars. It is indicated if a variety or cultivar already exists, the name of the breeder and how many suppliers offer this variety at the moment.

If the desired variety is listed in the router database, seed supplier can add their specific offer via clicking on “new offer”. The kind of seed, the seed quality and if necessary, an additional association certification, for instance Demeter association, can be adjusted. Additionally, the country of supply including specific delivery information, such as minimum order quantity or specific growing requirements for each country can be selected. For each country of supply, the control body can be adapted. At “edit” further information which is related to an offer will be displayed, for instance if the offer is linked to a species or sub-species group, information on tested for organic growing conditions of if the cultivar derives from a cell-fusion free breeding method.

If the desired variety or cultivar is not listed in the router database, seed supplier needs to create a new offer. New offers are created by matching a new variety or cultivar to a Latin species name, the breeder if known and the breeding method, such as organic or conventional. It is not possible to add one and the same variety/cultivar name twice. The system will create an error output to avoid doubling in the database. Equally to the offer setting described above, supplier needs to give information on the kind of seed, seed quality, if existing additional information on private certification, delivery information and availability for each country.

4.1.5 Confirm timeliness of my offers

If a supplier does not change any offer in the database for 30 days an automated generated e-mail is sent by the router database to remind the supplier to confirm the availability of seed offers. Seed



supplier needs to react on this e-mail by login to the database to the menu point “confirm timeliness of my seed offer” and update their offer. Updating can be performed for each country one by one or for all countries at once. If the timeliness is not confirmed by the supplier, a second e-mail will be sent out after further 15 days and a third e-mail another 15 days later. If the seed supplier does not react within the 60 days of warning, all offers of a supplier are automatically set to not available (red). This automated system shall ensure that seed offers are up to date and avoid that outdated offers are displayed any longer.

Table 2. Table of menu points in the organic seed suppliers’ account including content provided and detailed description

Menu point	Content provided	Detailed description
My account/ country management	Login management	Manage login details like user name, password and mail address.
	Address management	Edit main address.
	Country management	Overview of all countries that a supplier is operating in.
	Request a new country	Possibility to request to offer seeds for a new country.
	Manage logo	Upload a company logo to account.
My offers	Filter	Filter offers for example a certain cultivar name, country or status.
	Open all	Open all countries in which supplier is offering seeds.
	Close all	Close all countries in which supplier is offering seeds.
Offer tracking	History	Overview of all changes that are linked to supplier’s offers, for instance if availability has changed. Filter for certain time ranges, cultivars and countries.
Add new offer	Create new offer	Possibility to add a cultivar name to database.
	Add an offer	Possibility to choose a cultivar and add it to supplier’s offers.
Confirm timeliness of my offers	Confirm all countries	Confirmation that the availability of all offers is correct

4.2 National competent authority account

National competent authorities are the agricultural authority in each EU member state and Switzerland who are responsible for implementing the EU organic Regulations and for establishing, maintaining and regular update of the national organic seed databases. In several EU member states, national competent authorities designate a seed database manager, seed certification office, control body or research institute as their legal representative to implement and manage the national organic seed database. To each EU member state country and Switzerland, a national login to the database will be provided. Table 3 illustrates all menu points in the national authority’s or designated representative’s account including content provided and a detailed description.



4.2.1 User data

Authorities, or their legal representative, receive one national login account with possibility to create multiple logins for the revision of seed offer. This allows to give access to several people working in the same national account on behalf of a national competent authority. The login data, address, contact information and password settings can be managed in the menu under **user data**.

4.2.2 Seed supplier management

In a first step, authorities need to revise incoming requests of seed supplier that are interested to offer organic seed or vegetative propagating material in a country. Seed supplier provides their contact data and if available the national contact data for a certain country. Furthermore, seed supplier needs to give information on their organic control body and upload their organic control certificates. Automatically, the EU router database matches and validates the information provided by the supplier with the information of the information platform bioC.info. Authorities can decide to accept or reject incoming information either seed offer by seed offer, by species group or by all seed offers requested by a certain seed supplier.

4.2.3 Offer management

Offers that have been created by a seed supplier will pop up at the national authorities account under **offer management**. It is the national authority's or their representative's responsibility to revise all incoming seed offer if seed offer revision one by one has been set in the **seed supplier management** menu point (see 4.2.2 Seed supplier management). Several EU countries, such as Belgium, Denmark, France, Germany, Italy, Latvia, the Netherlands, Sweden and Switzerland have implemented seed expert groups to advise the competent authorities in all issues related to organic seed use and the Regulations referring to organic seed. National organic seed expert group may assist national competent authorities in evaluating the incoming seed offer towards suitability of cultivars. There might be different reasons for rejecting a seed offer by an authority. For instance, a lack of information to revise the incoming offer, the variety information is only available in a foreign language, no national contact point or trader is available, or the variety is considered as unsuitable. Those reasons can be specified for each country and are translated to the specific language. Authorities can choose one of the specified reasons and add an explanation text. Thus, the supplier will be able to understand the decision and react to solve the reason of rejection. If the authority wants to change the decision about an already processed offer, they can revise it under the menu point: Already processed offers.

4.2.4 Already processed offers

In already processed offers a list shows when seed offers have been edited by the authority, including information on the species name, variety/cultivar name, supplier name and contact information.

If the dot next to a variety/cultivar name is green, the seed offer is currently available. If it is red, it means that the seed supplier is currently out of stock. By clicking on the question mark, authorities can receive more information on the offered seed and the history of the evaluation. The authority can also see the date when the offer was created by the seed supplier.

4.2.5 Cultivar management

Here the national representative, if feasible with the support of national seed expert, can link varieties or cultivars to sub-species groups. Sub-species are technical groups which allow a species adapted classifications of crops. Species or sub-species classifications are made in three groups for which (i) no derogation is granted, (ii) individual derogation is granted, (iii) general derogation is granted (Raaijmakers and Schäfer, 2019). For instance, for placing species on a national Annex/no derogation list. The National Annex is a list of species and sub-species for which sufficient organic seed is available



on the national territory and for which no derogations are granted. For example, species are subdivided into sub-species such as wheat for baking quality and wheat for feed.

4.2.6 Sub-Species group management

At sub-species group management, a search for a certain variety/cultivar is possible. All sub-species groups that are linked to that variety/cultivar as well as the classification that is linked to a selection type is displayed. Via “edit” national representatives can change a classification, rename a sub-species group or deactivate a sub-species group for their country. New classifications (for instance “general derogation”) can only be generated by the administrator. Authorities need to contact the administrator to request a new classification which is then added to the system.

4.2.7 Offer tracking

In offer tracking all changes that are connected to all varieties and all offers in a country are displayed. This included changes related to the availability of a seed offer, detailed information regarding an offer and if the offer has been accepted or not. A search for a certain variety/cultivar name or for a certain time is possible.

4.2.8 Offer export

Authorities can download a list of available and not available offers as Excel-sheet at a certain date. Filtering is possible for a certain time period, evaluation results or availability. The document (.csv file) can be used by authorities to upload it to their own national database so their farmers can see the offers (if no API is in place).

4.2.9 Search for offers

The authorities will find an overview of cultivars that are currently listed for their country by seed suppliers and the status of its availability.

Table 3. Table of menu points in the national authorities or designated representatives account including content provided and detailed description

Menu point	Content provided	Detailed description
User data	Login management	Manage login details like user name, password and mail address.
	Address management	Edit main address.
Seed supplier management	Filter for seed supplier	Seed Supplier that are registered for your country, filtered by status.
	Decide about status	Decide to accept or reject supplier in your country.
	Authorization	Check the certification of the supplier.
	Accept offers automatically	Decide to accept all offers from a certain supplier automatically for certain categories (for instance cereals) or all categories.
Offer management	Offer management	Decide about new offers, accept or reject them, get more information about the specification of the offer.
	View decision	Overview of all already processed offer applications.



Already processed offers	Revise decision	Revise a decision about an offer if necessary.
Cultivar management	Management	View all cultivars in a country
	Edit	Edit the matched selection type and derogation procedure.
	History	View history of a certain cultivar.
Species group management	Management	Manage connected species groups and connect cultivar with them. Create or delete species groups. Connect a derogation classification to species group.
Offer tracking	Offer tracking	Possible to see all changes that are connected to offers in their country, for instance change of availability.
Offer export	Offer export	Export all available/non-available offers on a certain date in an Excel-file, chose the output language.
Search for offers	Search for offers	Search and list all offers in certain country. Can filter for cultivar name, species, date of creation, status of availability, status of authority acceptance and connected association (for instance Demeter).

4.3 Administrator account

- The administrator will be the responsible legal entity for hosting the EU router database. The administrator is in charge of data protection according to general data protection Regulation (EU) 2016/679, data storage and technical support. Requirements of the European Data Protection Regulation for data storage and personal data will be fulfilled.

Table 5 shows all menu points in the database management account including content provided and a detailed description.

4.3.1 User management

Shows an overview of all users having a login to the router database. This includes authorities and seed supplier. The administrator can make any changes to contact details, logins, address, linked countries and languages and deactivate or delete accounts. The administrator can define what rights the authorities have, if they can manage species groups (authority can create new species groups and match them to varieties) or can accept supplier registrations (authority can accept supplier applications for their country or they pass this task on to the administrator of the router database).

4.3.2 Countries

Here an overview of all countries using the router database is available. The language and regions are linked here to a country.

4.3.3 Regions

The administrator can define regions for a country. This is important if seed supplier wants to specify that they are only delivering in certain regions in a country.



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4.3.4 Languages The languages that are linked to a country are defined. Some countries have more than one national language, users can choose which one they want to use. Also, certain translations can be defined here.

4.3.5 Categories

Shows the categories of plants that are existing in the database. The crops can be linked to the categories to make it easier to search for. Table 4 shows the crop groups that are already implemented in the router database.

Table 4. Table of crop groups implemented in the EU router database

Crop group
Cereals
Pulses, Leguminous crops
Fodder crops / Grassland crops
Roots and tubers
Fibre plants
Oil crops / Oleaginous fruits
Medicinal plants / Medicinal herbs
Ornamental plants
Aromatic plants
Fruits
Vegetables
Wild plants / Wild fruits
Miscellaneous crops/Specialist crops

It is possible to enter/edit the translations of the categories in each language and add additional text.

4.3.6 Crops

The administrator can manage the list of available species. This includes details of the species, for instance common name in the selected language which is connected to the crop and the country. The list of species is background for the available species in all countries using the router database. If a species is added for one country, all users will be able to see the new species in all countries. The administrator can add new species by entering a Latin name and selecting one or several crop groups. The administrator should enter the common name of a species in each language and ensure that there is an entry for each language where possible.

4.3.7 Cultivars

The administrator can manage the list of all varieties/cultivars that are created in the router database. No changes are made without reason, but errors, such as misspelling or misleading information can be corrected by the administrator upon request by a user (authority or supplier). If suppliers would like to delete a variety, the administrator needs to check whether it is offered by anyone else before deleting.



4.3.8 Classifications

This section is only relevant for countries that are having species groups and different derogation processes (for instance single derogation and no derogation). The administrator can change the name of classifications as well as the accompanying sub-texts for explanation in each country.

4.3.9 Species groups

This section is only relevant for countries that are having species groups. The administrator can divide each crop into more than one selection type (sub group) and link a derogation process to it.

4.3.10 Other specifications

Also, the administrator can edit, translate, add or delete following specifications that can be used by seed supplier to specify their seed offers: seed breeding programme, type of seed, seed characteristics and associations.

4.3.11 Reasons for rejection

The administrator can add reasons for the different countries which they can choose from to define, why they are rejecting a seed offer from a certain seed supplier. Those reasons can be specified for each country and are translated to the specific language.

4.3.12 Seed flags

The administrator can add “tick-boxes” for the supplier when creating a new variety. These boxes can be specified for each country, for instance “tested for organic growing conditions”. It can be decided by each country if boxes must be ticked by the supplier or not in order to create an offer. When choosing mandatory, the supplier needs to tick at least one of the possible boxes in order to proceed.

4.3.13 Web page management

The list of existing pages which can be modified by administrator and not by software-company (for instance front-page) with using html. Links and pdfs can be inserted as well as external links.

4.3.14 Statistics

There will be three different reports for administrator possible:

- Offer export: exports all available offers in one country at a certain date. The administrator will get a .csv-file with all seed offers that are set on green that day, meaning they are available, including the species, variety name, breeder, breeding method, kind of seed, seed quality, delivery note, if applicable additional private certification, available quantity, name of the supplier and address.
- Time range export: will list all available cultivars in one country for a defined time range. Lists available period, matched species group and classification, date of offer creation at country level, species, variety name, breeder, breeding method, kind of seed, seed quality, delivery note, if applicable additional private certification, available quantity, name of the supplier and address.
- Authority report: define the time period, lists the offers that were sent from a supplier to authorities, and lists the decision about the offers, when and how it was processed. Specifications about: Country, date of offer creation at country level, species, variety name, breeder, breeding method, kind of seed, seed quality, delivery note, if applicable additional private certification, available quantity, name of the supplier and address, date of processing by authority, status in the country (rejected/accepted/processed) reason if rejected and contact person at authority.



Table 5. Table of menu points in the database management account including content provided and detailed description

Menu point	Content provided	Detailed description
User management	Administrators	Edit, add or delete user accounts. Manage login data, linked countries, possible functions and addresses.
	Authorities	
	Seed supplier	
Specifications	Countries	Edit, translate, specify, add or delete information about the specifications on the left.
	Regions	
	Languages	
	Categories	
	Crops	
	Cultivars	
	Classifications	
	Species groups	
	Others	
Reasons for rejection	Define them for each country	Define for each country reasons they can chose from when rejecting an offer from a supplier.
Seed flags	Define them for each country	Define for each country if the seed supplier can or must specify their offer when offering in a country, for instance tested under organic conditions.
Web page management	Manage contents	Modify and manage content pages with using html, insert (external) links and pdfs.
Statistics	Download statistics	Download offer export, Time range export and Authority report.

5 Provisioning, maintenance and financing of the European router database

5.1 Requirements for provisioning and maintenance

There are several aspects regarding maintenance of the router database to ensure that it is working, up-to-date and continuously technically improved. The administrator must be available for questions and support via phone or e-mail. The database operates non-stop, meaning there will not be any times at those it is not reachable except for maintenance work. The availability will be documented by a service provider, such as uptimerobot.com. The data on the router database will be saved at least every 24 hours automatically, to ensure that all data can be restored. A complete restoration of all data is possible within two hours. The data is stored on a servers MySQL server located in Germany. Data export of the router database to an access-database or a downloadable excel file is possible at any time and takes around five hours to create. Furthermore, the database is programmed having a high robustness and reliability, the used URL is tamper-proofed and “not-expressive”. There will be guides on how to use the database for the different users in all implemented languages. The router database can also be used on the mobile phone.

5.2 Financing concept



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To ensure complete help-desk support and maintenance of the database by the administrator, two technical skilled persons are needed to be familiar with the system. They need to speak at least English, but preferably other languages too and are familiar with the Regulations for the use of organic seed in organic farming. The responsible persons shall be able to fulfil all functions that are mentioned in 4.3 database account and 5.1 requirements for provisioning and maintenance. Additionally, there should be at least one person from a programming company to support when experiencing technical difficulties. Continuous improvements of functionalities, new features and implementation of barrier-free access to the database are needed. The router database is programmed and developed with the newest technology. Still, the technical solutions and requirements will improve and move forward. Therefore, it is recommended that about every ten years a reprogramming of the database is performed. For reprogramming financial resources need to be built over time. Additionally, a liability insurance should be taken into account to secure damage claims due to incorrect data or database failure.

Maintenance, provisioning and administrative support of the EU router database will create about 110.000€ costs every year:

- Technical support by an IT-company: 15.000 € per year
- Administrative support: 70.000 € per year (8 person months)
- Reserves for reprogramming: 15.000 € per year
- Liability insurance: 10.000 € per year

To cover those costs, there are different concepts possible:

Supported by seed supplier

Single financing through the seed suppliers would require a contribution per seed supplier. In addition, a quantity-based fee system could be developed for this purpose. This would require additional administrative effort. A fixed fee independently of the amount of offer listed may constitute an inhibition threshold, particularly for small and medium-sized seed suppliers of the router database. Furthermore, with the implementation of the new organic Regulation EC No 2018/848, the uploading of organic seed offer on the national seed databases should be free of charge for seed suppliers. Therefore, financing via seed supplier may create a barrier to use the router database, especially for countries with a small market for organic seed. Those countries tend to be the ones with rather low offers for organic seed.

Supported by national competent authorities

The national authorities would pay an annual fee, adapted and progressive regarding their size, seed offers and technical interfaces with the national databases. According to the organic Regulation EC No 834/2007 and the new organic Regulation EC No 2018/848, national authorities need to provide national seed database. Thus, there might not be a strong interest of national authorities to pay for a router database. Especially considering the fact that some countries have more financial resources for the organic sector than others.

Supported by European funds/European Commission/European Parliament

With the introduction of the new organic Regulation EC No 2018/848, uploading of offers into the database should be free of charge for seed suppliers and national authorities need to provide national databases. Thus, an alternative financing concept needs to be discussed. A central and European funded promotion, for instance via European funds, the European Commission or the European Parliament, of the router database would reduce the organic seed trade barriers and administrative burdens for supplier and national authorities. This would improve the competitiveness of the organic



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seed industry as well as the organic sector and harmonize the implementation of the organic regulations. Action point no 11 of the Farm to Fork strategy aims at support legislative initiatives to enhance cooperation of primary producers to support their position in the food chain and non-legislative initiatives to improve transparency (European Union, 2020). By integrating the EU router database in the organic action plan by the European Commission as well as in national organic actions plans by member states financing could be ensured.

6 Discussion on long-term potential of the European router database

The Farm to Fork strategy of the European Union strives to reach 25 percent of organic farming area in Europe by 2030 (European Union, 2020). At the same time, the use of non-organic seed shall be phased out by 2036 (Regulation EC No 2018/848). According to Eurostat (2020) the total organic area in the European Union was 12.6 million hectares in 2017, corresponding to 7 percent of the total utilised agricultural area. This represents an increase of 25 percent between 2012 and 2017 (Eurostat, 2020). Based on the latest supply estimation by Solfanelli et al. (2019) for the main crops in organic farming, for the year 2016 there is a gap of approximately 50 percent between organic seed supply and demand in Europe, if 100 percent organic seed use is envisaged. With increasing organic farming area, as foreseen by the Farm to Fork strategy, the demand for organic seed and by this the need to invest in the organic seed and breeding sector will increase by six folds. Döring et al. (2012) describe a lack of transparency and the frequent authorizations to use non-organic seed as reasons for the lack of investments in the organic seed and breeding sector in the past years. The EU router database offers a variety of long-term potential uses for the organic seed and breeding sector. The database could facilitate improved knowledge exchange between actors and solve as a dissemination platform and data repository. The EU router database could offer a platform to gather data from national derogation reports on the use of non-organic seed, national general derogation reports, the national classifications of species or sub-species in different derogation groups (e.g. general derogation, single derogation, no-derogation groups) as described in the new organic Regulation EC No 2018/848. Via further programming the database could provide an uploading platform and/or interfaces to integrate the above-mentioned data to the router database by the national authorities year by year. This public data collection related to organic seed and non-organic seed use could be used for yearly statistics, monitoring and improve research result quality and quantity. The lack of data or the complicated access to data is one of the main issues why scientific calculations on supply and demand, research results, statistics and monitoring of organic seed use in the EU is limited (Solfanelli et al., 2019). The dissemination of common testing protocols, e.g. organic variety testing schemes, and the use of common information sources, e.g. the EU common and national catalogues of varieties, can improve the data harmonization between EU member states. Also, post-variety test protocols, research results on variety tests, seed health and organic breeding concepts could be published in the database. All this would increase the transparency in the seed market and encourage seed supplier to invest in the organic seed and breeding sector.

Additionally, the US database SeedLinked could be linked to the EU router database. SeedLinked is an innovative interactive platform for on farm cultivar testing and tasting. SeedLinked aims at removing collaborative trailing frictions using a platform approach, mobile apps, real time data sharing and fully connected data via search engines (SeedLinked, 2020). A Europe-wide collection of cultivar testing results which are publicly available, for instance via the EU router database, would increase the farmers' knowledge on cultivars suitable for organic farming and thus could increase the use of organic seed and organic cultivars.

On June 25-26 2020 the EU router database was presented and discussed at the LIVESEED workshop to twelve north-western EU countries with about 100 participants (Schäfer, 2020b). In this workshop



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some representatives of national authorities claimed to see a good potential that the EU router database could serve as a platform for knowledge exchange also between national authorities. Representatives of national authorities would be interested to exchange their knowledge to other national authorities on national derogation rules, smart practices and national experiences in implementing the organic Regulations on organic seed. Exchange of pedo-climatic suitability of cultivars and cultivars testing results were of interest by authorities. The LIVESEED workshop on June 25-26 2020 revealed that there is a need to develop national road maps to plan and monitor the progress towards 100 percent organic seed use by 2036. The router database could offer the platform to develop and monitor such national road maps in future.

The new organic Regulation EC No 2018/848 article 13.2. states that plant reproductive material of organic heterogeneous material as referred to in paragraph 1 may be marketed following a notification of the organic heterogeneous material by the supplier to the responsible official bodies referred to in Directives 66/401/EEC, 66/402/EEC, 68/193/EEC, 98/56/EC, 2002/53/EC, 2002/54/EC, 2002/55/EC, 2002/56/EC, 2002/57/EC, 2008/72/EC and 2008/90/EC, made by means of a dossier. After having expressly or implicitly acknowledged the notification, the responsible official body may proceed to the listing of the notified organic heterogeneous material. That listing shall be free of charge to the supplier. The listing of any organic heterogeneous material shall be communicated to the competent authorities of the other Member States and to the Commission. It was discussed by national authorities if the newly created router database could serve as data repository and platform to inform other EU member states and the Commission on notifications of organic heterogeneous material.

The above mentioned potential broad data collection in the EU router database as well as the newly programmed data collection on organic seed supply and the corresponding decisions by the national authorities can be of use for the EU commission in monitoring the progress in the organic seed and breeding sector towards to use of 100 percent organic seed by 2036. The European Commission will need to develop a report to the European parliament on the availability of organic seed and reasons of a possible limited access of organic operators by 2026 (Regulation EC No 2018/848). The EU router database data collection can serve as a monitoring tool and provide data for the above-mentioned report in the year 2026. Furthermore, the data collection can be used to measure the success and impact of the EU router database. Thus, the results could show if the EU router database can serve as prototype to develop Europe-wide databases on the availability of organic animals and juvenile fish for organic animal farming and aquaculture.

Besides the large long-term potential of the database, it is of outstanding importance that the newly programmed EU router database will receive a high uptake by organic seed supplier and national authorities in all EU member states. If national authorities will refuse to revise and accept requested organic seed offer, seed supplier may be disappointed and reduce their ambitions to manage their seed offer in the EU router database. On the other hand, if only few seed supplier will list their seed offer in the database, national authorities might not experience the full potential of the database and thus reduce their ambitions too. There are two main critical points which can impact the uptake of the new EU router database by both target groups: dissemination and financing. To ensure proper dissemination on the availability of this newly programmed database more than 21 presentations on the EU router database have been conducted as described in paragraph 3.1 Stakeholder consultation. Official launch of the EU router database has been foreseen at the LIVESEED final conference for stakeholders and policymakers on 24 November 2020. This event is directly linked to the well-known annual Organic Innovation Day (OID) conducted by IFOAM EU. On November 25, 2020, at the European online-LIVESEED workshop the database will be presented in detail and further dissemination events are planned, e.g. an online web-seminar in spring 2021 and a presentation at BioFach 2021, the world's leading conference for organic products. The LIVESEED project officer has proposed to present the EU router database at the first Farm to Fork conference on October 15-16



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2020. DG Agri and DG Sante communicated interest to closely follow-up the implementation of the EU router database, e.g. by presenting the database a second time at the European standing committee of organic farming (COP). The second critical points to ensure uptake and long-term use by seed supplier and national authorities is the financing of the database. As described in paragraph 5.2 Financing concept, there is a tight frame of how the financing of the database could be ensured. Regulation EC No 2018/848 defines that entries to organic seed database shall be free of charge for organic seed supplier. At the same time, national authorities are obliged to provide national organic seed databases in which organic farmers and control bodies can check the availability of organic seed at their territory (Regulation EC No 2018/868). Based on the research results and reports from various publications, national organic seed databases lack proper funding and many databases remain far behind their technical potential (Döring et al 2012; ECO-PB 2013; Solfanelli et al 2019; Raaijmakers and Schäfer 2019; Schäfer 2020a). Thus, neither organic seed supplier nor national authorities will be motivated to ensure financing of the EU router database. Financing through the European Commissions or the European Parliament with support by the Units such as DG AGRI or DG SANTE or via further EU project funds would open the potential to further improve the database and implement some or all above described features in future. Furthermore, integration of the EU router database to the organic action plan by the European Union could ensure fast adoption and financing of the router database in future.

7 Conclusions and recommendations

The Farm to Fork strategy of the European Commission strives to reach 25 percent of organic farming area by 2030 (European Union 2020) and at the same time sets a deadline for the use of non-organic seed in organic farming by 2036 (Regulation EC No 2018/848). To achieve this ambitious goal, investments to improve the transparency and competitiveness of the organic seed and breeding sector in the EU are urgently needed. The newly programmed EU router database will provide transparency about the organic seed market and will offers various opportunities in increasing knowledge exchange between organic seed supplier to EU and national authorities as well as between the EU member state authorities. The continuous data collection on organic seed supply and the corresponding decisions by EU member states allow monitoring opportunities for the European Commission. To ensure success and impact of the database, uptake by all stakeholder groups and a secured financing in future are most critical. Through integrating the EU router database for organic seeds to the organic action plan by the European Union as well as to national organic action plans by the EU member states, the database could achieve fast uptake and financing. Accompanying research could investigate what improvements and functionalities are needed in the database to allow continuous use by the different actors, close knowledge gaps and create incentives for seed supplier to invest in the organic seed and breeding sector. Evaluations of the router database information systems success from an organisational and individual user's perspective could measure the impact.



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10 Annex

10.1 Guide for router database for national authorities

10.2 Guide for router database for seed suppliers



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European Router Database

Guide for Authorities

English



Welcome to the European Router Database!

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Registration

You will have received your log in details for the website <https://c01.oxsdemo.fiblprojekt.de/rdb> from the administrator of the router database. If you encounter any problems with this process, please contact xenia.gatzert@fibl.org

Please remember your details for future use. If you forget your password, you can request a new one under 'forgotten password' at the front page of the website <https://c01.oxsdemo.fiblprojekt.de/rdbuser/forgotpasswordpage>.

Search for organic seed supplier

Here you can search for offers from different seed supplier in all European countries. This search is also available for users with no log in, also you don't need to be logged in to use the search. You have to choose a country and you will get a list of all suppliers that are currently listing offers in this country and all cultivars. Then you can optional filter for a certain supplier or a certain cultivar. You can neither view if a certain offer is currently available nor which cultivar of a species is listed in this country. For those information you have to look at the national organic seed databases which can be found here: <https://www.liveseed.eu/tools-for-practitioners/eu-organic-seed-databases/>

Offer management

Here you can accept or reject the offers that seed supplier want to offer on your national organic seed database.

The offers are ranked according to the date when the seed supplier has created the offer. You will find following information on the offer: Created on, Species, Cultivar name, Supplier name and address for your country. If the dot next to the cultivar name is green, the seed is currently available. If it is red it means that the seed supplier is currently out of stock. If you accept the offer and the seed supplier sets it to green (available) it will be automatically updated without you being notified again. You can either accept or reject an offer. If you reject it, please give a reason. When clicking on the question mark you will receive more information on the offered seed and the history of the evaluation so far.

Once you have accepted or rejected an offer, you can click on refresh and the offers will disappear in this menu and appear under "Already processed offers". If you want to change a decision please go to the "Already processed offers".

If you want to accept all offers from a certain supplier please go to "Seed supplier management".

You can filter the new offers with this filter options:

Already processed offers

Here you can see the list of already processed offers. You will see when it was last edited by you, Species name, Cultivar name, Supplier name and address for your country. If the dot next to the cultivar name is green, the seed is currently available. If it is red it means that the seed supplier is currently out of stock. When clicking on the question mark you will receive more information on the offered seed and the history of the evaluation so far. On the right you will see the date when the offer was created by the seed supplier.

If you need to change an old decision you can do this directly beneath Evaluation. Please refresh the offers afterwards.

Seed Supplier Management

Here you can get an overview over the seed suppliers that have registered themselves as suppliers in your country. The filter automatically shows all new suppliers that have registered for your country. You are able to filter for those seed supplier that are already accepted, the ones you rejected or the ones that are new or under review because you may need some additionally information before making a decision (Note: If you cannot see rejected or applying countries you have not yet the right to accept them or you have passed this task to the administrator of the database. If you want to change that, please contact the database administrator).

You can search for a certain name of a supplier and see the address. When clicking on the seed supplier you will get further information like certification details. You can also automatically accept all or certain crop groups from a seed supplier, so you don't have to accept each offer that they want to offer in your database. By clicking on "Accept all offers and future offers" you won't get a notification anymore when the supplier offers a new cultivar but it will be included in your download file (see "Offer export"). You can also chose certain crop groups f. e. cereals. Then all offers that belong to cereals will be automatically accepted.

You can also accept only offers not reviewed yet, which means that all current offers are accepted but you will have to decide about offers of this supplier that they will create new after today. You can revoke such an automatic acceptance for each supplier anytime.

You can reject the supplier to be able to offer seed in your country, when rejecting, please give a reason and a contact name. This reason will be send automatically to the supplier so he can react on that. You can also reject all offers from this supplier then, and the open offers will be rejected and appear in the section “Already processed offers”.

Offer Tracking

Here you will find all changes that are connected to all cultivars and all offers. You will see changes in availability, detailed information regarding an offer and if you have accepted an offer or not.

You can search for a certain cultivar name or for a certain time.

Offer export

Here you can download a list of available and not available offers in an Excel-sheet for the current date. You can filter if the offers are available and if you have accepted them already or not.

Search for offers

Here you can search for offers that were send to your country from supplier. You will see the date when they were first created by a supplier, the species and cultivar name, if they are currently available for your country /green= yes, red= no), if given which quantity is available and which supplier offers the seeds. You can filter for certain options.

User Data

Here you can change the address of your authority and add or delete login data. Note: for each login you can only use one unique email address that is not connected to a different login.

Only for countries using OrganicXseeds as national database:

Cultivar management

Here you can link a cultivar of a certain cultivar to a selection type. You will see the cultivar name, the cultivar it belongs to, the breeding method, how many suppliers are offering this cultivar in your country and how many selection types already exist.

When clicking on Edit you will be able to select the selection type that is linked to the cultivar (more than one is possible) and also be able to create a new selection type for this cultivar. You are also able to search for a certain species, cultivar or selection type.

Species Group management

Here you can search for a certain cultivar. You will see all species groups that are linked to that cultivar as well as the classification that is linked to a selection type. If you want to change a classification, rename it or deactivate it, click on *Edit* of the according species group. If you want to add a whole new classification (f. e. General derogation) please contact xenia.gatzert@fibl.org

Please make sure to have an English translation when creating a new selection type, so also foreign suppliers know what selection type their cultivar is grouped into.

European Router Database

Welcome to the European Router Database!
Guide for Suppliers

English



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Registration as supplier

Go onto the website: <https://c01.oxsdemo.fiblprojekt.de/rdb>

Click on *Register as organic seed supplier*. **Address of the contractor:** Fill in your company details.

Login data: Create your personal LogIn, with a Login name, Login password and an Account email. Please note, that while you can create several Logins you need one specific email address for each of them. You can use this email address for resetting your Login name and password.

Once you have forwarded your details, you can log in with the Login name and password on the top right of the website. You will have only limited menu options until you were accepted by the database manager.

Activate your countries

Select the country you want to deliver seed offers to. Read and accept the AGBs. Type in the address of your office in the country that should be displayed to the farmers in this country. If you have none just click on “Use the main address” and the information from your registration will be inserted here. Give the information for an intern contact person that should be contacted by the database administrator in case there are questions to your offers. Note: This contact person will not be displayed on the contact information for the farmers, please use the sales address for those information.

Certification: Please select your control number from your control body in the country. There will be a search for this number in bioC (www.bioc.info). Upload a copy of your certification. The competent authority in the country you are registering for will check the details before accepting you as a new supplier.

Please also chose your control body in the country from the list or in case you have none in the country you are registering for, from your head office.

Once the country has decided about your application as a supplier you will receive a mail to your contact mail of the country and then you can activate your offers for this country.

Search for organic seed supplier

Here you can search for offers from different seed supplier in all European countries. This search is also available for users with no log in, also you don't need to be logged in to use the search. You have to choose a country and you will get a list of all suppliers that are currently listing offers in this country and all cultivars. Then you can optional filter for a certain supplier or a certain cultivar. You can neither view if a certain offer is currently available nor which cultivar of a cultivar is listed in this country. For those information you have to look at

the national organic seed databases which can be found here: <https://www.liveseed.eu/tools-for-practitioners/eu-organic-seed-databases/>.

My offers

Here you will be able to manage your seed offers. You will see a list with all your current offers. By clicking on “Open all” you can open all information on countries of all offers and also close them again (“Close all”). You can also open the information about the countries just one by one offer by clicking on the arrow on the top right of each offer.

You can filter your offers for different options:

The screenshot shows a filter interface for seed offers. It includes a search bar for 'Cultivar name', a dropdown for 'Species' with a 'Choose' button, and a 'Filter for:' section. The 'Filter for:' section has three columns: 'Offers' with radio buttons for 'Available' (green dot), 'Unavailable' (red dot), and 'Archived'; 'Response from national authority / designated body' with checkboxes for 'In process', 'Accepted', and 'Rejected'; and 'Country' with a 'Select option' dropdown. Five red callout boxes provide instructions: 1. 'Here you can search for a specific cultivar' points to the 'Cultivar name' search bar. 2. 'Here you can search for a specific species' points to the 'Species' dropdown. 3. 'Here you can select all offers in a specific country' points to the 'Country' dropdown. 4. 'Filter here, if you have set the offers on available, not available at the moment or archived' points to the 'Offers' radio buttons. 5. 'Filter here, if an offer is already accepted, in process or rejected by the competent authority' points to the 'Response from national authority' checkboxes.

When clicking on the arrow next to a cultivar you will see in which countries you are offering the seeds, the status of it in the different countries and you can manage if the offer is available in each country. You are also able to see if there exists an assurance about a cell fusion breeding method and if yes, who gave it. Once this assurance was uploaded, it cannot be retaken. In case you need to do this, please contact the database administrator. By clicking on the **country** you can add hints that should be displayed in this country with the offer. You can also set an available quantity. Note: It will be most helpful if the hints are in the national language or in English.

You can set your offers on green (available at the moment) or red (not available at the moment in this country) or you can archive it which means you don't offer this cultivar anymore at all. There you can also reverse the archiving. Next to the status you will see the status of your offer in the country: In process means it has not been decided yet by the

competent authority if the offer will be accepted. You can contact following persons in case you have questions to the feedback: *Following in real version*

When clicking on the **history** you can see the history of availability, decisions of the competent authority etc. regarding your offer. Note: This information will be updated every night, so you will be able to see changes the next day.

When clicking on **Edit master data** you are able to edit the seed form, the seed quality and add a certification association if your offer has an additional association. By **archiving in all countries** you will set the offer in all countries on not available. You can undo the archiving anytime.

Offer tracking

Here you can see the recent history, changes and decisions of your seed offers. You can search for a certain cultivar or in a certain country or for a certain time range. Also if a country has accepted your offer will be displayed here.

Create a New Offer

Please search if the cultivar name you want to offer does already exist in the database. For doing so, search for a certain cultivar or species. All cultivars that match your search will be displayed. You can see the breeder that is connected to the cultivar and how many supplier offer it at the moment. If you spot mistakes please let us know and send a mail to xenia.gatzert@fibl.org.

If the cultivar you want to offer is listed please click on “New offer” to add it to your offers.

Then you fill in the seed form, seed quality and if necessary an additional association certification (f.e. Demeter). Then you can tick in which countries you want to offer the seeds.

You can also give certain hints for the different countries (f.e. minimum order quantity or specific growing requirements). All offers will be automatically be set on green (available). You can set them manually on red (not available).

If you click on “Edit” you will see the species groups that a cultivar is linked to, if there are more information given (Characteristics f.e. tested for organic conditions) that are defined by the responsible authority and if it is a cell fusion free species and if yes, you can see the declaration of assurance.

If the cultivar you want to offer is **not** listed please click on “Create new offer”: You will be asked to match the cultivar to one cultivar, name the Latin name, breeder if known and the breeding method (Note: The breeding method can be conventional, although your seeds are propagated organically).

Note: If the cultivar name you type in does already exist the database will give you an error note and you will not be able to create this cultivar. If you cannot find this cultivar in the Cultivar Search, please contact the database administrator.

After naming the breeder you fill in the seed form, seed quality and if necessary an additional association certification (f.e. Demeter). Then you can tick in which countries you want to offer the seeds.

You can also give certain hints for the different countries (f.e. minimum order quantity or specific growing requirements). All offers will be automatically be set on green (available). You can set them manually on red (not available). The offer you created needs to be accepted by the country`s authority to be displayed in the national organic seed databases. They have the possibility to accept automatically all offers that you are creating for this country. You can see the changes of your offers and the acceptance in `Offer tracking` or under `My offers`.

Confirm timeliness of my seed offers

If you don`t change any offer in the database for 30 days you will receive an automatically generated email to remind you to confirm the availability of your offers. To do so, please click in the menu on Confirm timeliness of my seed offers. If you don`t do this, you will receive another email after another 15 days and another after further 15 days. Then your seed offers will be automatically set to not available (red). You can confirm the availability for each country or for all countries together.

My account / country management

Here you can manage your login details, address information, contact details, operating countries and logo. Note: For each login you can only use one unique email address that is not connected to a different login.

Country management: Here you can edit contact information and office addresses for the countries you are operating in. You can also see the actual status in a country, if an authority has accepted you as a seed supplier or not. You can also chose to deliver just to certain regions within a country by selecting them.

You can also request new countries:

Read and accept the AGBs. Type in the address of your office in the country that should be displayed to the farmers in this country. If you have none just click on "Use the main address" and the information from your registration will be inserted here. Give the information for an intern contact person that should be contacted by the database administrator in case there are questions to your offers. Note: This contact person will not be displayed on the contact information for the farmers, please use the sales address for those information.

Certification: Please select your control number from your control body in the country. There will be a search for this number in bioC (www.bioc.info).

Upload a copy of your certification. The competent authority in the country you are registering for will check the details before accepting you as a new supplier.

Please also chose your control body in the country from the list or in case you have none in the country you are registering for, from your head office.

Once the country has accepted you as a supplier, you will be informed via mail and can activate your offers for this country.

Under **Manage logo** you can upload a logo, if you wish to. It requires following format: 400px by 300px, up to a size of 256kb and of type jpeg, png, or gif.

For more information

For more information on the European Router database, technical difficulties or to provide comments or feedback on the website, please contact xenia.gatzert@fibl.org.