PROJECT DELIVERABLE REPORT

Deliverable 7.1: Initial version of the FF Management Platform functional

Fruit Flies In-silico Prevention & Management

FF•IPM

Project Title:

In-silico boosted, pest prevention and off-season focused IPM against new and emerging fruit flies ('OFF-Season' FF-IPM)

SFS-2018-2

"This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 818184– H2020-SFS-2018-2

Document Information

Grant Agreement Number	818184	Acronym	FF-IPM
Full Title	In-silico boosted, pest prevention and off-season focused IPM against new and emerging fruit flies ('OFF-Season' FF-IPM)		
Topic	SFS-05-2018-2019-2020 New and emerging risks to plant health		
Funding scheme	RIA - Research and Innovation action		
Start Date	1st September 2019	**Duration**	48 months
Project URL	http://fruitflies-ipm.eu/		
EU Project Officer	George PREDOIU		
Project Coordinator	UNIVERSITY OF THESSALY – UTH		

Deliverable	**D7.1 – Initial version of the FF Management Platform functional**			
Work Package	WP7 – Sustainability – development of infrastructure and establishment of business-based innovative services for decision-support in FF prevention and management			
Date of Delivery	**Contractual**	M7	**Actual**	M7
Nature	Report	**Dissemination Level**	Public	
Lead Beneficiary	UTH			
Responsible Author	Prof. Nikolaos Papadopoulos	Email	nikopap@uth.gr	
		Phone	+30-2421093285	
Reviewer(s):	FF-IPM Consortium			
Keywords	FF Management Platform, Architecture			

Revision History

Version	Date	Responsible	Description/Remarks/Reason for changes
0.10	26/02/2020	UTH	Deliverable structure set-up (Papadopoulos)
0.20	01/04/2020	CIRAD	Review of the first draft (DeLatte)
0.30	01/04/2020	CSIRO	Review of the first draft (Kriticos)
0.40	03/04/2020	UTH	Final draft developed (Papadopoulos)
0.50	06/04/2020	R&DO	Final draft revised (Tsimas)

0.60	10/04/2020	UTH	Revision of the final completed
0.70	11/04/2020	RMCA	Final draft revise by the TM (De Meyer)
0.70	13/04/2020	EB	Final draft approved
1	21/04/2020	UTH	Final draft submitted

Table of Contents

1 Summary

This report outlines the initial version of the FF Management Platform as described in WP7. It provides a general overview of the platform's architecture, along with the adopted technologies. Furthermore, it gives a descriptive showcase for the implementation and next steps.

FF-IPM's ambition is to develop and implement innovative, holistic, and computer (in-silico) assisted IPM strategies and expert services to enable effective prevention, detection and control of FF that pose a major threat to the lucrative European horticultural production sector.

FF-IPM's outputs will be made available to stakeholders and end-users (clients) through the FF Management Platform, which is expected to be the central point for the presentation and provision of a range of entirely new expert services to be provided by FF-IPM. It should be noted that in the FF domain, no examples of such an integrative service system in Europe exist to date.

Finally, the work under WP7 will explore the opportunities to commercialise the on-going provision of expert services so that the benefits can be delivered sustainably.

2 Introduction

2.1 Purpose and Scope

A new web-linked end-user-friendly infrastructure (FF Management Platform) is being developed at UTH within the framework of the project. Its primary purpose is to ensure broad and lasting stakeholder-access to the new knowledge generated under WP2, and tools, technologies and services developed under WP3, 4, 5 & 6. In addition, the platform will serve technology dissemination and stakeholder training operations, conducted under WP8.

The FF Management Platform contains archived documentation of the project accomplishments, and structured, dynamic web-based access to novel expert services.

Within FF-IPM, we will focus on the pre-commercial development of the technologies and services. We will explore opportunities to sustainably finance the delivery of these information services. Where appropriate, we will explore commercialisation opportunities and attempt to bundle the technology in a manner that avoids market failures. The established technical infrastructure of the FF Management Platform will serve as one-stop-gateway to provide public access to technical documentation, and structured access to user-selected services. It will consist of a generic segment accessible by the general public, stakeholders and technology end-users, and will contain all project-generated technology information. In addition, it will have a segment with secure, restricted access, designed for registered end users. To enable operation of alert DSS system Workspace and CLIMEX/DYMEX Server will be installed on the platform.

The work for the development of the FF Management Platform is preliminary. During the first months of its implementation, only a first design and implementation took place. It is expected that the final FF Management Platform will be further developed, and its final version will be ready by M24.

3 The FF Management Platform overall architecture

3.1 Structure

The FF Management Platform is a fully dynamic web application that allows for user interaction and focuses on user-friendly navigation through the technical content the FF IPM project has created. Clear and intuitive menus provide a simple view allowing the user to focus on searching and filtering the project's available data and not be overwhelmed by unnecessary information.

Development of the platform is handled by the Network Implementation Testbed Laboratory (NITLAB) of the Department of Electrical and Computer Engineering at the University of Thessaly (https://nitlab.inf.uth.gr/) under the supervision of Prof. Nikos Papadopoulos. Hosting of the platform is done on NITLAB's Cloud infrastructure which is suitable for this purpose as it manages a plethora of cloud and testbed web services. The servers are located in Volos, Greece.

The FF Management Platform is an independent tool from the project's official website (https://fruitflies-ipm.eu) and the project's intranet, which is however, integrated and hooked in the central portal of the project. Design-wise, the look and feel of the FF Management Platform is in line with the official website so that the platform looks integrated and acts as a part of the ecosystem. Users can find a link to the FF Management Platform from the official website menu.

There are three main web-based instruments created by the project: the overarching web portal, the intranet and the FF-Management Platform.

Each of the three have a distinct role and objective and altogether they comprise FF-IPM's e-presence.

The main functionality of the FF management platform is to facilitate easy content browsing and help users accurately find a specific item through descriptions and important keywords. User management is also a key factor in order to allow open unrestricted access to one section of the site and flexibly restrict access to other sections for operational reasons in line with our data sharing plan. There are user authentication menus with actions such as login, logout & register positioned at a visible spot on the navigation bar, however they

are unobtrusive, allowing the main feature of the platform to be searching and navigating through the project's created content.

In general, the FF Management Platform will consist of two areas:

a) The Project Accomplishment Archive for archiving project accomplishments to ensure open access and public availability. This will be the main section of the site, the home page - the data will be publicly available and searchable without requiring user login.

b) the Expert Services Catalogue, a client-communication facility with active links to external (e.g. SME-based) expert services. This section is similar to the first one but is restricted to registered users only. Each section has its own tab that the user can select.

In the future, several specialised services, such as pan-European Decision-support system alerting about FF-invasion risk (DS-Alert), the On and Off-Season IPM services (DS-VirtualFarm) and rapid taxonomic pest identification (PestID), will be made available through this site. While the interface requirements have not been developed yet, this will be a live, interactive system, and it will probably require a third area on the FF Management Platform. The prototype system is due for delivery in M24, and the website development and DS-Alert systems and IPM services will need to co-evolve.

3.1.1 Project Accomplishment Archive

The main feature of this section is a powerful search bar that enables the user to perform searches based on keywords and then filter out the results. In general, a keyword is an arbitrary word that represents context that is related to a search. A keyword can represent either general information (Company, Author, Title etc.) or more specific parameters like Geographical Area. It can also be any one of the four categories (Technical description, Technical advisory notes, Case-study, Project publications). The use of keywords is very intuitive to the user when searching for something and allows for accurate filtering of information in the database. The system automatically generates a list of related keywords each time a new item is created by the admin.

Results are listed in either alphabetical or publication date order and each entry contains a summary, a few basic keywords related to the results and a related picture. Furthermore, all keywords in each search are listed in a small separate section, so that the user can further filter the results from a query. For example, one can search for all papers in the project publications category and then filter out keywords that are not of interest.

Upon selecting an entry from the list of results, the user is taken to a full page that contains all information about the selected entry such as all keywords, a full description, important details and finally links for further information. A download link is also provided.

3.1.2 Expert Services Catalogue

This area is protected by user authentication, which means registration and login are required for accessing page content. This section of the platform has the same look and feel to the Project Accomplishment Archive. The same feature of a search bar is also employed here, but the keyword search has been adjusted to specific characteristics of the services being offered and to the SMEs that provide them. A user for example can search for a specific SME that provides a specific service, or for a list of services provided by various SMEs for a specific area of interest.

Clicking on a service will load a new page containing a detailed description, further details such as instructions and an external link to the service provider's URL.

3.2 Technologies used

For the purposes of creating the FF Management Platform, WordPress (https://wordpress.com/) was used as the underlying content management system (CMS) platform. Further functionality was added by incorporating stable plug-in applications. WordPress and CMSs in general, are mature technologies specifically tailored for showcasing content. They have a rich ecosystem of developers, with plug-ins created to provide system functionality including issues around security, optimization and visual design. They are a perfect match for the FF-IPM platform's functionality, which revolves around user management and displaying created content. Below, a brief explanation of what a CMS and WordPress are.

A CMS is a software application or set of related programs that are used to create and manage digital content. CMSs are typically used web content management (WCM) systems. A WCM facilitates collaborative authoring for websites and has two components: a content management application (CMA) and a content delivery application (CDA). The CMA is a graphical user interface (GUI) that allows the user to control the design, creation, modification and removal of content from a website without needing to know anything about HTML (most of its use is drag-n-drop). The CDA component provides the back-end services that support management and delivery of the content once it has been created in the CMA.

WordPress is a free and open-source content management system (CMS) written in PHP and paired with a MySQL or MariaDB database. Features include a plugin architecture and a template system, referred to within WordPress as Themes. Areas in which WordPress excels are blogging websites, E-commerce, News, Photography and Membership to name a few. WordPress is one of the most popular content management system solutions in use.

Taking advantage of WordPress' deep plug-in architecture, further functionality was added such as:

1. **Item showcase/display:** An e-commerce plugin was used, for structured and compact display of items, modified not display price or purchase options to the user. Emphasis was placed on representing text descriptions attractively (such as summary, effects etc.) and the ability to add extra information such as guidance videos and external links. Finally, keyword management was also very important, so when an item is created, searchable keyword tags are added.
2. **Search tool:** Powerful searching and filtering options are provided in order to facilitate easy browsing and locating a specific document fast. Keyword filtering has been made general so that documents from different categories can be found with a common keyword.
3. **User management:** User management was implemented to restrict access to specific portions of the site. Furthermore, hash encoding has been used to enhance password security.

4 Detailed description of the FF Management Platform

In this section, the implementation of all aspects described in the system's architecture section are demonstrated.

4.1 Home page

This is the home page (Fig. 1), the main greeting page that the user sees. As mentioned previously, the look & feel of the FF-IPM platform is in line with the project's main webpage (https://fruitflies-ipm.eu/) so that the platform looks integrated and acts as a part of the main page. The user can stay on this page and search the Project Accomplishment Archive for technical documents or click the Services link (top left) and move to the Expert Services Catalogue section.

Figure 1: FF Management platform Home Page

4.2 Searching & filtering

The user has the ability to search by category the Project Accomplishment Archive (Fig. 2). The 4 basic categories of the project's contents are:

i. Technical Descriptions of FF-IPM-developed tools and experts services
ii. Technical Advisory Notes on novel methods, strategies and their implementation
iii. Case-study examples and generic operational scenarios
iv. Copies of project publications, presentations, videos, and other project generated materials that will be publicly available.

By clicking on a category, the user can browse all content related to the selected category.

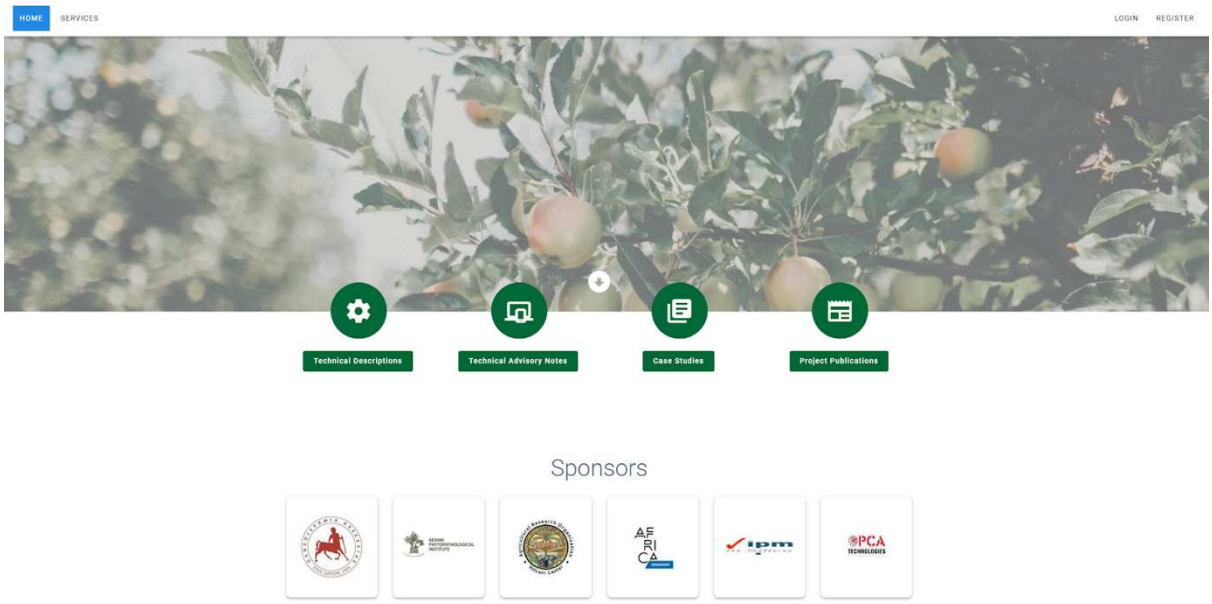

Figure 2: FF Management platform Project Accomplishment Archive

When the user selects a category to search (in this example, Project Publications, Fig. 3), they receive a listing of all related entries and a list of all related keywords is created on the right. The user can further filter the received list by specific keywords.

Figure 3: FF Management platform filtering results

4.3 Free browsing

So far, the above description demonstrates how a user can search only one of the four categories. However, they can also freely browse all available data and filter out content based on keywords of interest (Fig. 4). For example, they can search all 4 categories for a specific crop or specific sprayers.

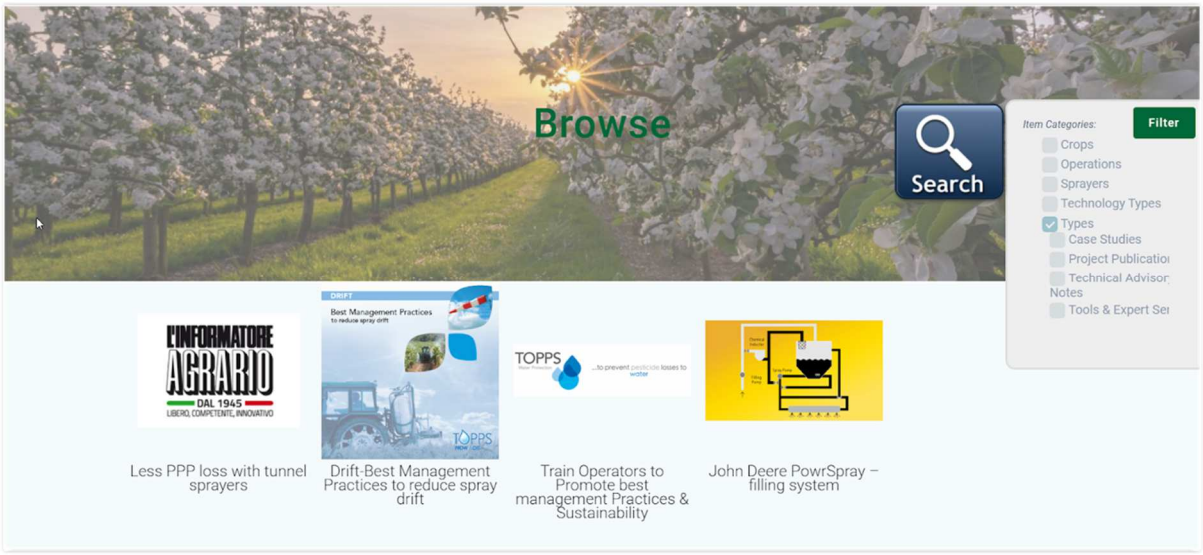

Figure 4: FF Management platform free browsing

Finally, after finding the document of interest the user can see a detailed description of the item, the keywords associated with it, in case they want to search for more documents with a specific keyword (Fig. 5). A download link is also provided as well as external links for further information.

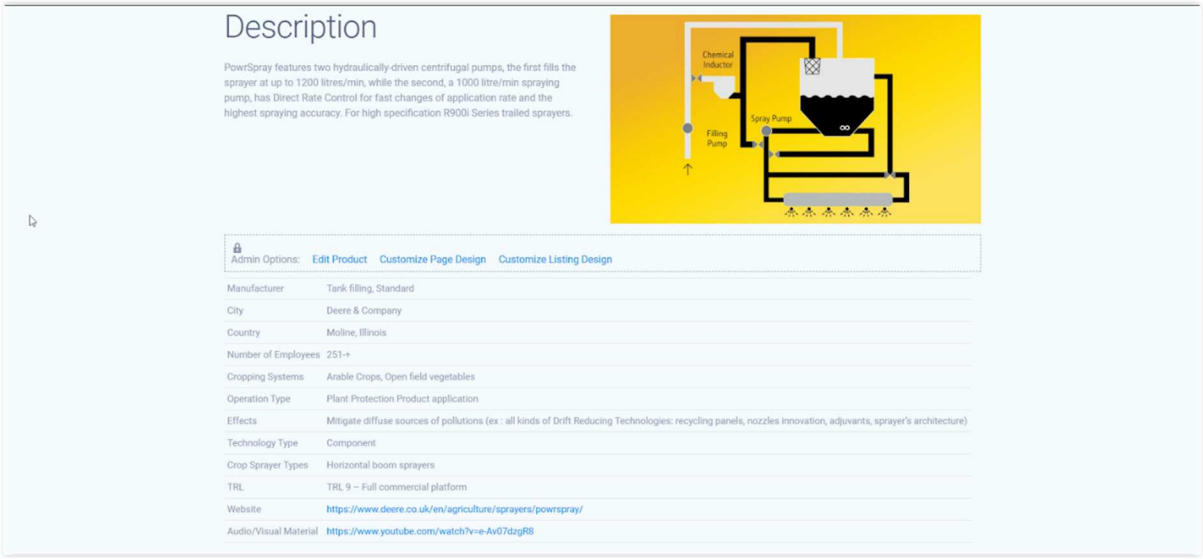

Figure 5: Description of an example technical document

4.4 User authentication

The Expert Services Catalogue area of the FF-IPM Platform requires new users to register (Fig. 6) to the platform providing some contact details and financial information for the purposes of paid subscriptions. Users are also provided with a list of available services and their corresponding pricing to select.

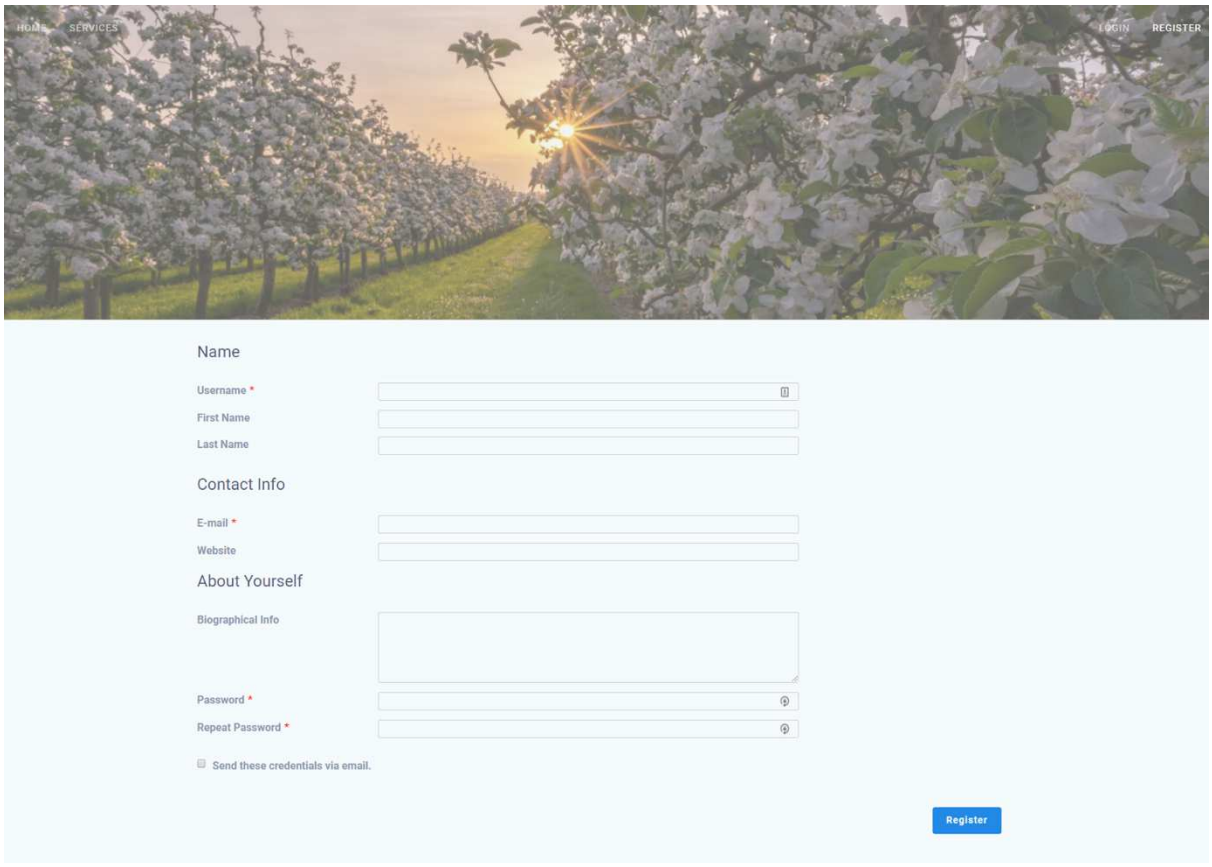

Figure 6: Register menu for new users, when accessing the Services section

Existent users can simply login (Fig. 7). All ethical aspects will be enforced, including a GDPR notice and cookies policy, as described in Deliverable 9.1.

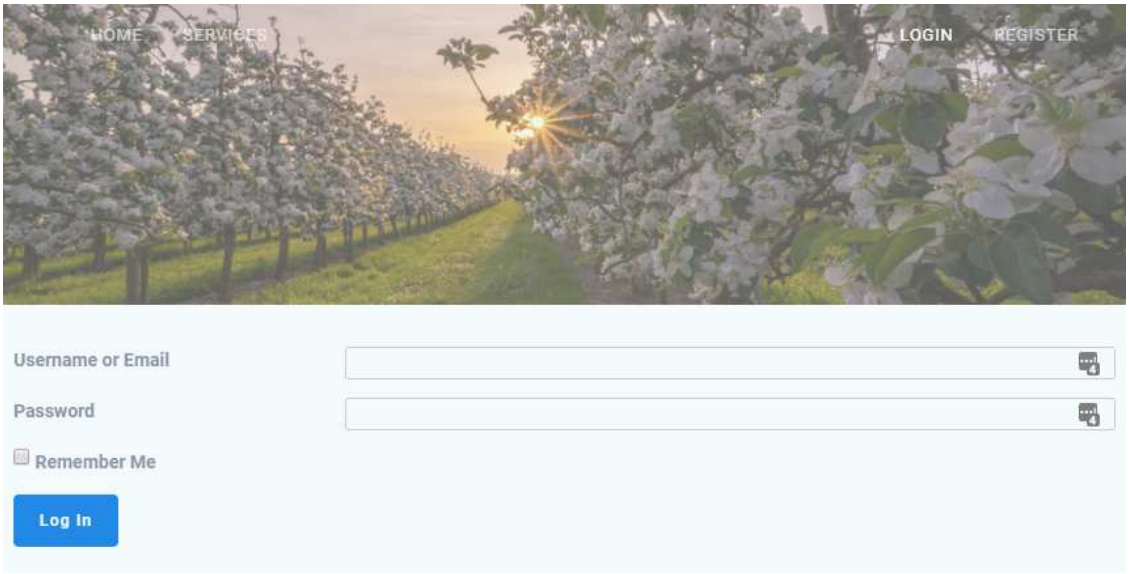

Figure 7: Login menu for existing users accessing the Services section

4.5 User authorization

Expert Services Catalogue is an area of the FF IPM management platform available only to registered members, therefore cannot be accessed by everyone (Fig. 8). During the registration process a user can specify which services they are interested in, thus when accessing the Services area, the appropriate content is generated.

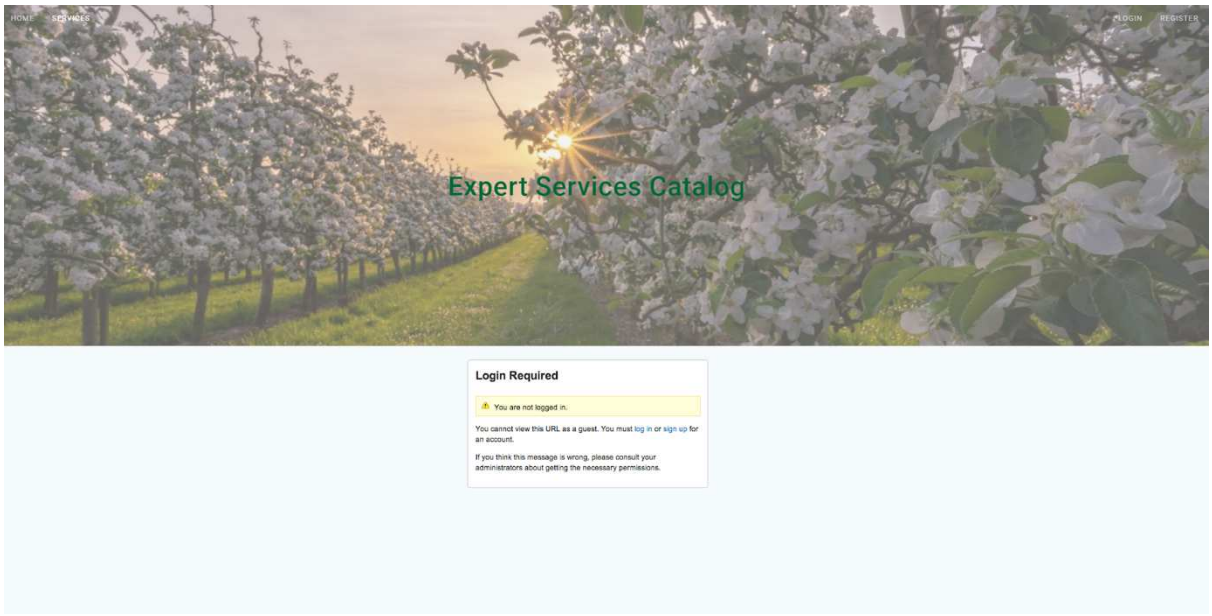

Figure 8: Restricted area

5 Data Management

The data management follows the guidelines as described in the Data Management Plan – DMP (D1.1), which describes the data information that will be generated during the project and the challenges and constraints that need to be taken into account for managing it. The FF Management Platform follows all the procedures and manages the data as described in D1.1. Storage information and documents generated during the project will be stored on the Intranet and the Management Platform which is the all-around project management system of FF-IPM. This information, data and documents produced during the project will be protected for a period of time after the project completion, as is described in the Grant Agreement and the Consortium Agreement (CA) and subsequent decisions taken by the Executive Board (EB).

6 FF Management Platform sustainability

Sustainability issues of the FF Management Platform will be further explored and presented during the next period and after the finalisation of the implementation of the FF Management Platform. However, it should be noted that the FF Management Platform will continue its operation after the end of the project and aims to be a sustainable tool/product that will serve the specific scientific and business community. UTH is

committed to continue the operation and maintenance of the FF Management Platform for at least five (5) years after the end of the project. During the next months, a detailed exploitation plan will be developed and will include a map of the exploitable outcomes in relation of the specific business models and the targeted stakeholders.

The FF Management Platform will integrate the novel expert services that FF-IPM will establish.

It should be noted that the private companies/technology providers of the consortium will use the FF-IPM system and/or its major components to enhance and advance their product portfolios (i.e. upgrade their regular product/service portfolio and/or to develop new innovative products and services).

The exploitation and sustainability plan of FF Management platform will cover (1) business models and plans, (2) commercial exploitation strategies and (3) assessment of overall project impact. Business models and plans will be defined, discussed and finalised within the next months of the project and before M24. Exploitation strategies that will be developed per partner and product will be integrated in order to use synergies, optimize market potential and maximise impact.

Exploitation Activities: The FF Management Platform exploitation strategy will comprise of a bouquet of exploitation activities which include:

1. the ***identification of the innovative exploitable assets***, whether these are technological components, models or added value services, which FF Management Platform will deliver through its results to its target users,
2. the ***conduction of a thorough market analysis*** which will aim at the identification of the market towards which FF Management Platform is targeted, its segmentation, the positioning of current competitors and all corresponding emerging trends,
3. the ***documentation of an analytical IPR management strategy*** based on the principles outlined in the project CA which will guide the joint and individual exploitation capabilities of the project partners,
4. the ***analytical definition of a risk management strategy***, aiming not only at managing research, technical, financial, management, exploitation and other related risks as they appear, but mainly at proactively acting so as to avoid the appearance of these risks,
5. the ***analytical definition of all possible commercial and non-commercial exploitation models***,
6. the ***analytical definition and evaluation of the sustainability and viability of possible business models*** and alternative solutions that may be followed for the provision of FF Management Platform to the identified stakeholders, including licensing schemes, pricing, etc., and the corresponding tactical revisions as deemed necessary throughout its lifecycle,
7. the ***establishment of tactical alliances with other industrial or research organisations*** that hold the potential of promoting the FF Management platform,
8. the ***establishment of relationships of trust with customers early within the project***, who can facilitate the quicker adoption of the solution and provide valuable feedback which can be used in the commercialization phase,
9. the ***identification of financial support*** from diversified funds that can be used to support direct and/or indirect commercial transformation, ranging from additional research activities to bug fixing and to technology integration in existing or future solutions.

Exploitation Models: The consortium recognizes three main exploitation models for the FF Management Platform:

1. The ***commercial exploitation model***, which implies the paid provision of FF Management Platform to the end users, complying with a licensing scheme which will be defined in the business plan,

2. The ***research exploitation model***, which implies the re-utilisation of the research know-how acquired in future research activities, and
3. The ***technological exploitation model***, which implies the re-utilisation of the technological know-how acquired for the development of innovative products and the provision of advanced services built on top of them.

7 Conclusion

The initial version of FF Management Platform as described in WP7 (T7.1) is being developed as described above. Both the overall architecture and the technologies that underly its structure, as well as, how it can be used were analysed.

Next steps involve further facilitating the interconnection between the FF Management Platform and the SMEs' services, as well as, populating the system with content from the project. Finally, after user input, visual improvements will be made, and further features will be added. In addition, the work under WP7 will explore the opportunities to commercialise the on-going provision of expert services so that the benefits can be delivered sustainably.

The final report on the FF-IPM management platform will be delivered on M24. It will include all described new functionalities.