Deliverable 10.1
Construction of a Website portal

Project Acronym	**ENTOMATIC**
Project Reference:	**605073**
Project Title:	**Novel automatic and stand-alone integrated pest management tool for remote count and bioacoustic identification of the Olive Fly (Batrocera oleae) in the field**

Deliverable 10.1 – Construction of a website portal to be updated until the end of the project

Revision: v2.0

Authors:

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Dissemination Level		
P	Public	X
C	Confidential, only for members of the consortium and the Commission Services	

Revision History

Revision	Date	Author	Organization	Description
1	12/03/2015	Veerle Versteirt	AVIA-GIS	
2	30/01/2016	Albert Bel	UPF	Update of the content

Statement of originality:

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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1 INTRODUCTION

In this document we briefly present the website created for the ENTOMATIC project.

This website has different goals. First, it intends to be a **repository** of the different deliverables, publications and other results that have to be completed by the ENTOMATIC consortium. Second, an important fact is to **promote** the evolution of the ENTOMATIC project. With the publication of the public deliverables, publications and other materials, any person or company interested in the project could obtain **valuable information** to follow it, and its **achievements**.

The website is placed under the URL http://entomatic.upf.edu, and it has been developed by the Universitat Pompeu Fabra (UPF) following the institutional guidelines.

2 STRUCTURE OF THE SITE

The site has been divided in different sections. Those sections are detailed in the following paragraphs.

2.1 PRINCIPAL PAGE

The principal page of the web reflects the summary of the project, as well as European commission logo as the financial entity of the project. Moreover, the project logo is also attached together with a slideshow of representative photos of the project.

The summary text is the following:

ENTOMATIC *addresses a major problem faced by EU Associations of Olive growing SMEs: the Olive fruit fly (Bactrocera oleae). This insect pest causes yearly economical losses estimated to be almost €600/ha.* ***ENTOMATIC*** *aims to develop a novel stand-alone field monitoring system comprising: a fully autonomous trap with integrated insect bioacoustic recognition embedded in a wireless sensor network and supported by a spatial decision support system.*

The ability to quantify and make a precise control of Olive fly populations in a cost-effective way, has been a long desired goal in the Olive sector. The potential offered by ***ENTOMATIC*** *has SME-AGs and their associated SMEs keen on its development. The expected benefits are the reduction of damage to olive fruit and oil production and to promote the sustainable use of pesticides. Via* ***ENTOMATIC****, olive producers will be able to track pest population and geographical status and receive advice on precision pesticide application.*

The consortium is composed of SME-AGs of Olive Producers from the EU and Turkey, and lead-user SMEs expert in Pest Management solutions. These will lead the specification, validation, protection, and use of the results generated by the selected RTD providers expert in Entomology, Decision Support Systems, Bioacoustics, Electronics, Signal Processing, IT solutions, Wireless Communications and Prototyping.

ENTOMATIC *is a business opportunity identified and championed by the consortium SMEAGs. These will jointly exploit the IP generated in the project with the lead-user SMEs who will be in charge of production and distribution. Both parties will use their own associate and customer networks as initial commercial routes.*

Moreover, as it could be observed in figure 2.1 we have added contact information with a contact email, entomatic@upf.edu, in order to collect all those questions and suggestions from the website's visitors.

Finally, a direct link to the Cordis portal has been included at the European flag logo.

Figure 2.1: Principal page of the web

2.2 CONCEPT AND OBJECTIVES

This second page is an introduction of the main purpose of the project, introducing the problema that the project consortium is going to solve and which are the main objectives that we fixed at the beginning of the project.
The text included is the following:

The EU Problem to Solve
Olive cultivation is widespread throughout the Mediterranean and is vital for the rural economy, local heritage and environment. The area under olive groves in the EU is approximately 4.376.000 hectares, 4 % of the agricultural area. Approximately 2.5 million producers (one third of EU farmers) are involved. Olive production is the main source of employment and economic activity in many regions, and the sector is basically dominated by SMEs united in associations. The average holding size is as low as 1 ha in Italy, though olive holdings in Spain are larger (6 ha on average) and the annual net income per hectare can reach €1.897.

Figure 2.2: Olive fruit affected by the fly

The EU is the leading world producer, accounting for 80% (>2 million tones) and consuming 70% of the world's olive oil. Turkey, Tunisia, Syria and Morocco produce over 0,5 million tones. The main aim of the €2.3 billion/year EU Olive oil common market policy is to promote the production of a high-quality product for the benefit of growers, processors, traders and consumers. However this sector is continuously under the threat of an extremely destructive insect pest: Bactrocera oleae, the Olive fruit fly. Each year it accounts for more than 30% destruction of all Mediterranean olive crops, i.e. losses of almost €3.0 billion.
Stings caused by females laying eggs destroy the value of table fruit and damage of larvae causes premature fruit drop. Females can lay 50-400 eggs, one per fruit, there can be several generations and populations develop rapidly. Adult flies can live 2-6 months depending on temperature and food availability. Olives are the only breeding hosts under constant threat from March until November, and the greatest damage occurs as the fruit begins to ripen (September to November).
In Europe, the tolerable fruit damage threshold for table fruits is only 1% and for oil is 10%. Despite the higher tolerance, the problem for oil is that, while feeding, the larvae introduce rotting organisms (bacteria and fungi) that create off flavours.

Why SME-AGs decided to lead the ENTOMATIC proposal
The Bactrocera oleae is controlled with aerial and ground bait pesticide sprays, but their efficiency depends on the time and location of insect infestations. Early detection of these infestations is therefore crucial. To detect and count them, olive producers set up traps in the field that lure and capture Olive flies. But these traps can also accidentally capture other species of insects rendering the counting difficult. Species specific pheromones may be used, but these only attract males. To capture females food

lures are used, but these are generic and attract again other species. So periodically the producer has to inspect traps to identify and selectively count only Olive flies.

Figure 2.3: An example of actual trap

Based on this tedious and rudimentary Integrated Pest Management (IPM) methods, producers can only make an "educated guess" on the need to spray pesticides. Not only is this far from efficient; in between inspections a serious infestation may occur. This procedure (identifying, counting and spraying) needs to be repeated throughout most of the year, but many traps only have a lifetime of 1 month and need to be replaced. Inevitably the producers compensate the faulty IPM procedures with excessive spraying of pesticides, which affects natural enemies of the pests, contaminates water, and carries the risk of exposure to humans. Moreover, aerial sprays will be banned by the EU to limit the risks of human exposure, reinforcing the need to improve IPM trapping procedures and ground spraying. The Sterile Insect Technique cannot be applied in the EU, where cultivation is organized in small nuclei.

Although €5 billion are spent yearly on pesticides in the MED-8 countries Spain, France, Italy, Portugal, Greece, Cyprus, Slovenia, Malta), this investment doesn't solve the infestation problem. Interviewed Olive growers stated two problems: a) the manual counting is not correct because it is done in a hasty way and decisions of when to spray are taken based on the few manually inspected traps; b) small cultivators usually join and hire a service to spray based on findings in step (a). However, the spraying is often performed without following correctly the spraying charts.

INOLEO, AJAP and AEGEAN state that in the absence of an accurate monitoring and alarm system, farmers generally over-spray to levels of more than 30%, often in vain. The cost of infestation by Olive flies is in the best case an inferior product, reducing the revenues by up to 50% for superior extra virgin olive oil, up to 80% in total oil value and in the worst case the loss of a whole harvest (100% loss). For this reason, the SME-AGs INOLEO, AJAP and AEGEAN together with TEIC developed the concept behind ENTOMATIC and, with the participation of key SMEs PHYTO, PULS and BIOSYS, decided to lead this project for which the RTD subcontractors were selected based on their experience and value for money.

The Proposed ENTOMATIC Solution

The ENTOMATIC system aims to offer EU Olive SME-AGs an advanced IPM system for Bactrocera oleae, based on an innovative trap capable of automatically counting each insect trapped, identifying the species based on bioacoustic analysis and send the data wirelessly. The proposed system will also be able to function autonomously during the whole fruiting season, have an operative life-time of at least 5 years and be adapted to handle other fruit flies.

Figure 2.4: ENTOMATIC network

IPM relies on the accuracy of the pest population monitoring technique. Without gathering information of pest dynamics and related ecological factors it is almost impossible to execute the appropriate pest control at the right location and time. Extended monitoring programmes in Greece and Spain using a combination of different state-of-the art traps, more frequent inspections of traps, extensive manual count and species identification of captured insects, and manual processing of collected data shared between regional and national authorities, demonstrated that the fruit losses provoked by the Olive fruit fly could be reduced by 50%, with a 60% reduction of insecticides used and 60% increase of extra virgin oil.

Obviously the (labour & financial) cost and complexity of these laborious massive manual inspections and manual treatment of data is not affordable for olive producers. It is evident that existing IPM systems do not fulfil the need of the Olive industry as these are not autonomous or collect and send data automatically. Moreover, EU regulations aim to promote low pesticide-input farming and urge the establishment of novel and better IPM techniques and crop specific standards. With the recent developments in microelectronics, communications and bioacoustic analysis, a cost-effective solution may finally be developed with the expertise of the subcontracted RTDs UPF, TEIC, IMMS and Avia-GIS.

Our aim is to develop an easy accessible system, which enables an automatic and cost-effective IPM against Bactrocera oleae for all end-users. In addition, the proposed system can be a powerful tool for regional/national authorities to enforce legislative requirements, which need data collection on a regular basis to achieve a sustainable use of pesticides. The ENTOMATIC system will enable the Olive SME-AGs and their members to improve their production, reduce the amount of pesticides used and reduce the labour cost associated with spraying activities and inspection of traps. Based on published studies, the experience of the consortium SME-AGs and SMEs and interviews with several producers, the participants expect a reduction of the Olive fruit fly damage, a reduction of spraying costs and an increase of productivity, using ENTOMATIC.

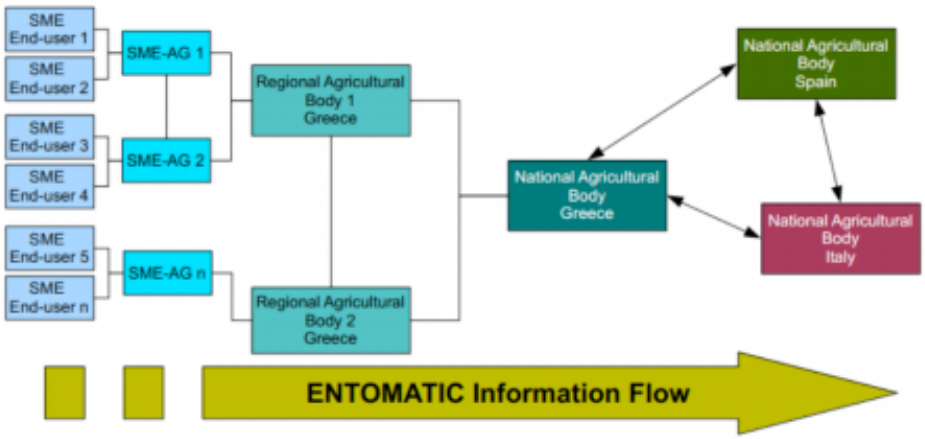

Figure 2.5: ENTOMATIC information flow

The ENTOMATIC trap units are easily installed in olive trees by the end-users. Following modern IPM procedures for the deployment of Olive fruit fly traps, a density of 2-4 traps/ha will be used in small holdings and in fields with uneven topography. One ENTOMATIC trap will be deployed for every two hectares of large scale fields of homogeneous lands. Within the same field the traps form a low-power mesh network, will be capable to communicate wirelessly between each other and finally the collected data will be sent to the ENTOMATIC Gateway.
This gateway, equipped with a meteorological station, transmits the field data to the ENTOMATIC Monitoring & Management Central (using a link like GPRS/GSM or Wi-Fi). This central is hosted by a Cloud Provider, which makes the collected processed data available on a secured internet platform. The end-users can use this on-line platform as an easy to access the IPM tool, using just a common laptop, a smart-phone or a tablet PC.
ENTOMATIC will enable the possibility to set-up a European Network for Integrated Olive fruit fly Pest Surveillance, adaptable to other flying insect pests. The ENTOMATIC systems in each Olive growing SME are connected to their respective SME-AG. The information collected by each SME-AG cluster provides pest information at regional and national scales, giving authorities a powerful tool to understand at a higher level the impacts and risks imposed by the presence of the pest. EU countries using the ENTOMATIC system can share their data at a transnational level.

How does the automatic trap work?
Flies (males and females), attracted by the combination of baits and lures, seek an entrance into the trap, and are detected by a photo-interrupter. Since the fly may have erratic movements or even leave the trap, the count is only processed when it passes by the second photo-interruptor. As soon as this happens, the Bioacoustic Identification system starts recording the audio signals produced by the fly.

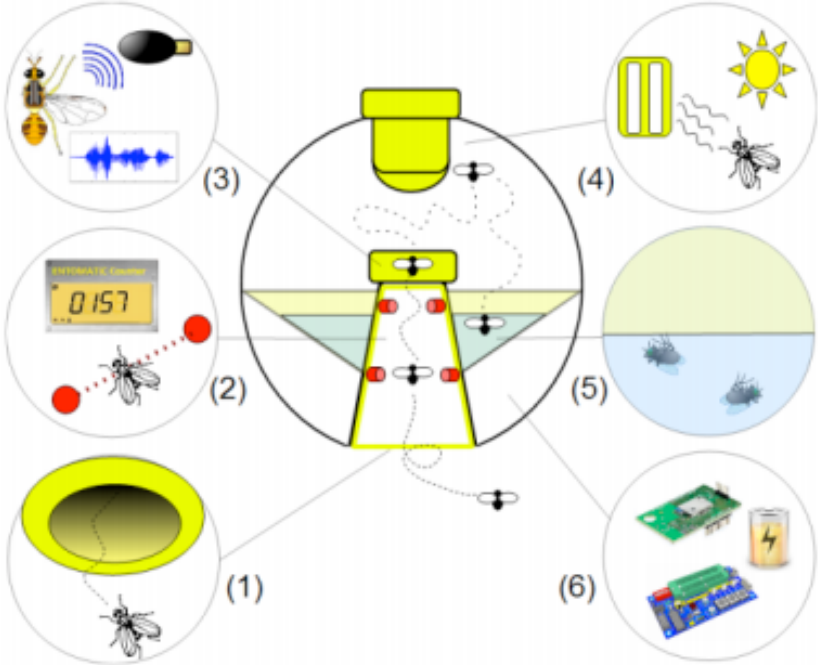

Figure 2.6: ENTOMATIC trap

The digital signal processed at the Gateway will identify if the species entering is Bactrocera olea or not. The fly will not return where it came from, since it will be lured to the pheromone bait and by the sunlight or to the liquid food lure where it will eventually drown and die. All the electronics (signal processing, communications, power, etc.) are placed at the bottom part of the trap. The data collected as well as the position of the trap (GPS) and weather data will be transmitted from the Gateway, feeding the management central software.

2.3 PARTNERS

For the development of this project a cooperation structure between RTDs and SME-AGs has been established. This means involving different participants with complementary experiences necessary to optimally develop the project; highlights the many technologies that come together in this project, making optimal development system format of cooperation, facilitating the smooth and rapid development of the proposal.

The consortium partnership consists of twelve distinct and complementary entities such as:

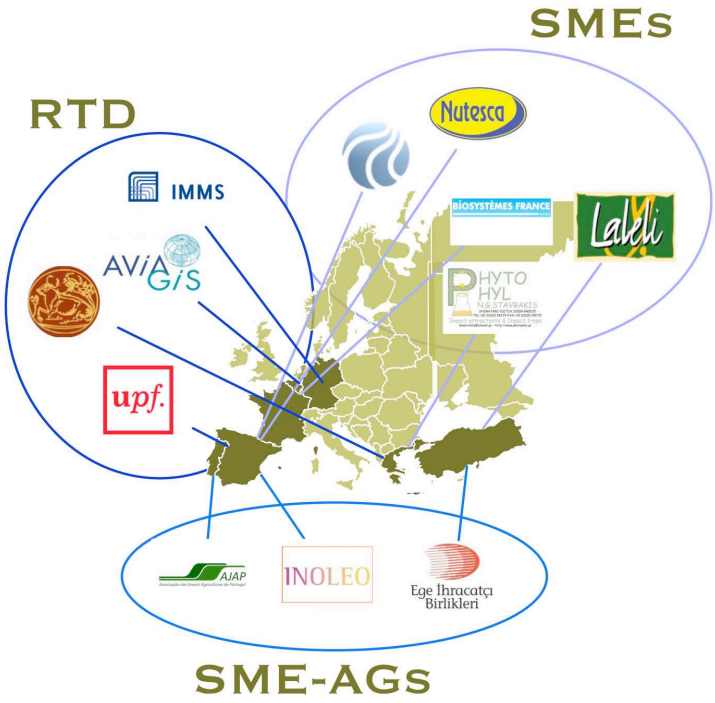

Figure 2.7: Partners

Moreover, in this section, it is possible to obtain information on the main roles and contact persons of every participating partner.

2.4 DISSEMINATION

This part has been created, in order to disseminate the projects achievements. All the scientific publications done by partners will be published in this section. The section is divided in four main parts:

1.- Media News: it contains all the dissemination done for the general public. It includes institutional partner's websites and appearances in radio stations, newspapers and websites from general media.

2.- Dissemination material: Different material created by the consortium members to disseminate the project.

3.- Scientific Publications: scientific papers accepted in different journals or conferences will be announced in this subsection.

4.- Technical reports: the participation of students from the different members of the consortium has also another important point. Their contributions will be reflected here.

ENTOMATIC

Home | Concept & Objectives | Partners | Dissemination | Deliverables | News | Related links

Media News

Partners websites

UPF http://www.upf.edu/enoticies/home_upf_es/0935.html#.VO7SykLFaeE
AEGEAN http://www.egebirlik.org.tr/egitimler-projeler.asp
AVIA-GIS http://avia-gis.com/services/ict
INOLEO http://www.inoleo.es/index.php/en/projects/internationalization/187-entomatic.html?eprivacy=1
CITOLIVA http://citoliva.es/index.php/proyectos/449-entomatic
MTSYSTEM http://www.mtsystem.es/1/perfil_empresa_550751.html
IMMS http://www.imms.de/wissenschaft/forschungsprojekte/entomatic-2101.html
http://www.imms.de/wirtschaft/projekte/entomatic-2101.html
AJAP http://www.ajap.pt/index.php?option=com_content&view=article&id=155:entomati

Greece

Appearance on the magazine Farming farming_magazine_greece.pdf

Turkey

Appearance on different turkish newspapers turkish_press_release.pdf

Italy

Teatro Naturale http://www.teatronaturale.it/tracce/mondo/19979-meno-trattamenti-e-piu-tecnologia-per-il-controllo-della-mosca-delle-olive.htm

Spain

RAC1 (Radio Station) "Noticies RAC1 - Environmental news of the day (1/10/2014)"
La Vanguardia (newspaper) http://www.lavanguardia.com/natural/20141001/54415622420/red-de-sensores-y-trampas-ayudara-a-controlar-la-mosca-del-olivo.html
RuralCat (Catalan Government website) http://www.ruralcat.net/web/guest/noticia/-/journal_content/2002/10136/8096333/la-mosca-de-l-olivera-podra-ser-controlada-amb-sensors-sense-fils
Agencia Sinc (news agency) http://m.agenciasinc.es/Noticias/La-plaga-de-la-mosca-del-olivo-podra-ser-controlada-con-redes-de-sensores-inalambricos
Escuela Valenciana de Cata http://evcata.es/mosca-del-olivo-sensores/
Infaoliva (Association of olive oil producers) http://www.infaoliva.com/documentos/boletines/RESUMEN%20DE%20PRENSA%20%20%201.10.2014.pdf
Olimerca (Journal of the olive sector) http://www.olimerca.com/noticiadet/nuevas-tecnologias-para-controlar-las-plagas-de-la-mosca-del-olivo-/6a99109461 0f079cca6192d7b43bb81c
Casil (Sociedad Cooperativa San Isidro Labrador) http://www.casil.es/webcasil/nuevas-tecnologias-para-controlar-las-plagas-de-la-mosca-del-olivo/?lang=en

Dissemination material

Distributed leaflets:

Scientific Publications

- I. Potamitis, Rigakis I, Fysarakis K Insect Biometrics: Optoacoustic Signal Processing and Its Applications to Remote Monitoring of McPhail Type Traps. PLoS ONE, November 2015.
- Sergio Barrachina, Toni Adame, Albert Bel, Boris Bellalta. GOAT: A Tool for Planning Wireless Sensor Networks. MACOM 2015.
- I. Potamitis, I. Rigakis. Novel Noise-Robust Optoacoustic Sensors to Identify Insects through Wingbeats, IEEE Sensors Journal, August 2015.
- I. Potamitis, K. Fysarakis, D. Longueville and S. Ntalampiras. Hardware implementation of a system classifying the optoacoustic signature of insect wing flap, the 22nd International Congress on Sound and Vibration, Florence, Italy July 2015.
- I Potamitis, P. Eliopoulos, D. Kontodimas. The electronic McPhail Trap and a potential revision of the decision protocol. 7th meeting of the IOBC/wprs WG, Integrated Protection of Olive Crops, Kalamata, Greece, May 2015
- I. Potamitis, I. Rigakis, K. Fysarakis. Remote monitoring of insects of economic importance based on the spectral analysis of their wing-flap, 9th EARSeL SIG Imaging Spectroscopy workshop, Luxembourg, April 2015.
- I. Potamitis, I. Rigakis, K.Fysarakis. The Electronic McPhail Trap. Sensors, November 2014.
- I. Potamitis, P. Schäfer, On classifying insects from their wing-beat: New results, Ecology and acoustics: emergent properties from community to landscape, June 2014 Paris.

Technical Reports

- S. Barrachina Muñoz. GOAT: Development of a Wireless Sensor Network analysis tool. Technical report, 2015.
- J.A. Pérez Cano. Web-based Wireless Sensor Network Platform. Technical report, 2015.

Figure 2.8: ENTOMATIC dissemination site

2.5 DELIVERABLES

In this section the public deliverables will be published in order to give more information on the project achievements. The public documents will be available at this site.

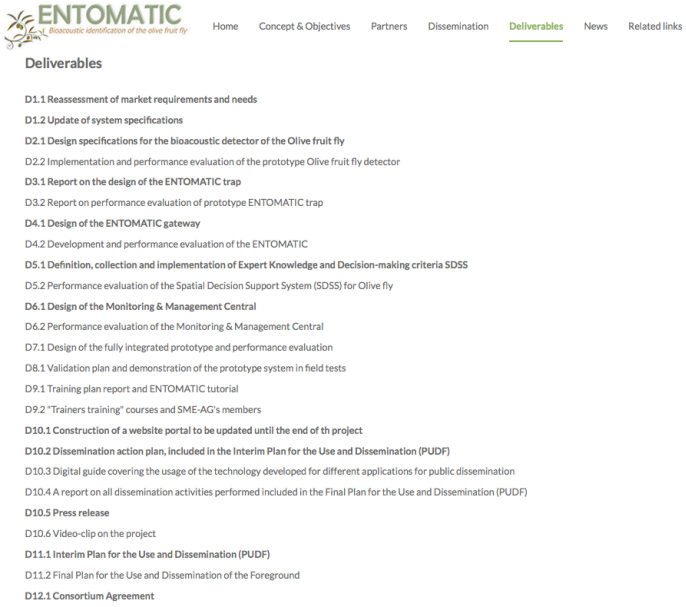

Figure 2.9: ENTOMATIC dissemination subpage.

2.6 NEWS

In this section all the news referent to the development of the project. This offers a quick update of the development of the project.

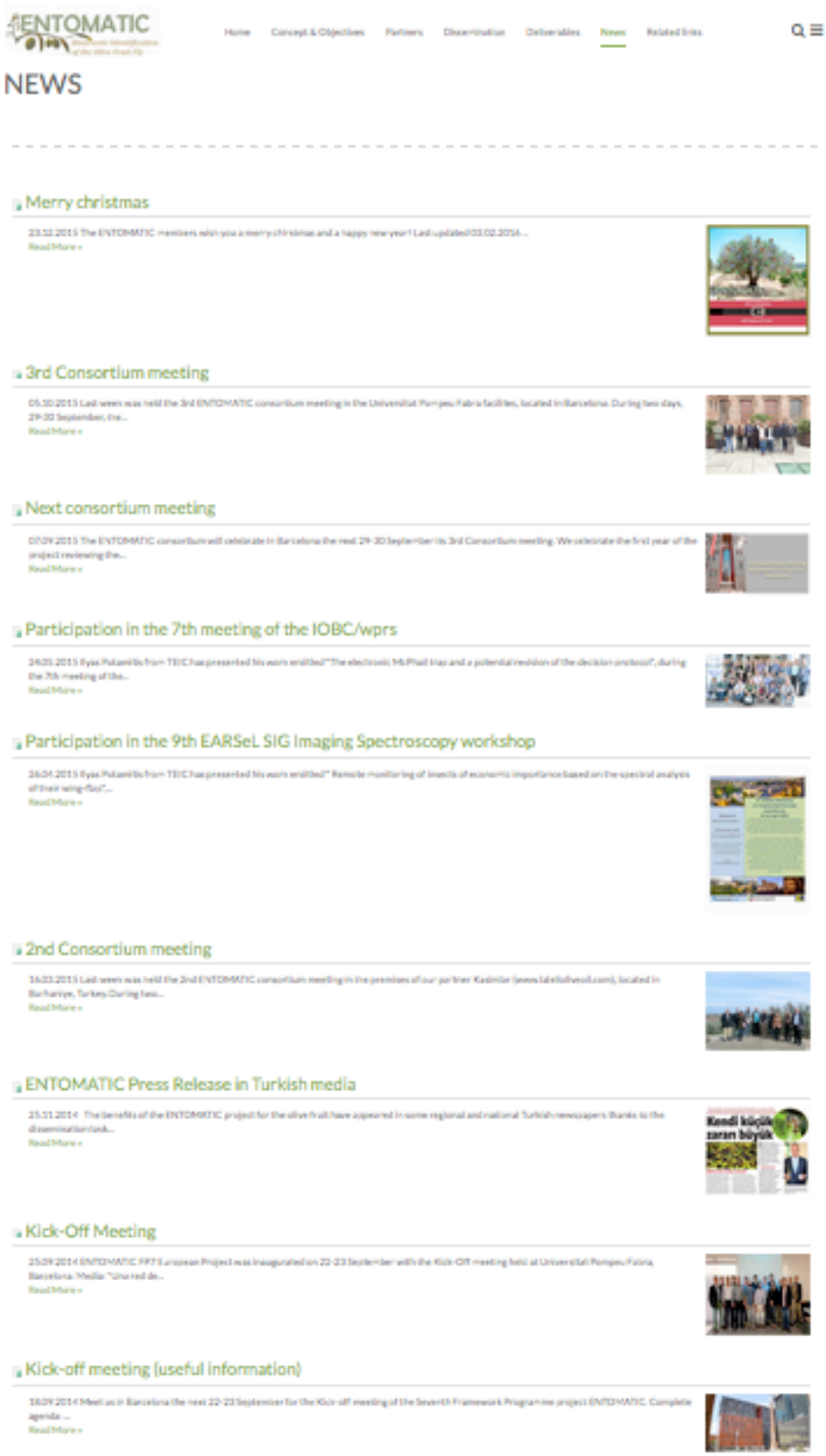

Figure 2.10: News page

2.7 RELATED LINKS

This section included useful links related with the purpose of the project. The links offered are related with the main European countries that produce olives. These links are divided per country.

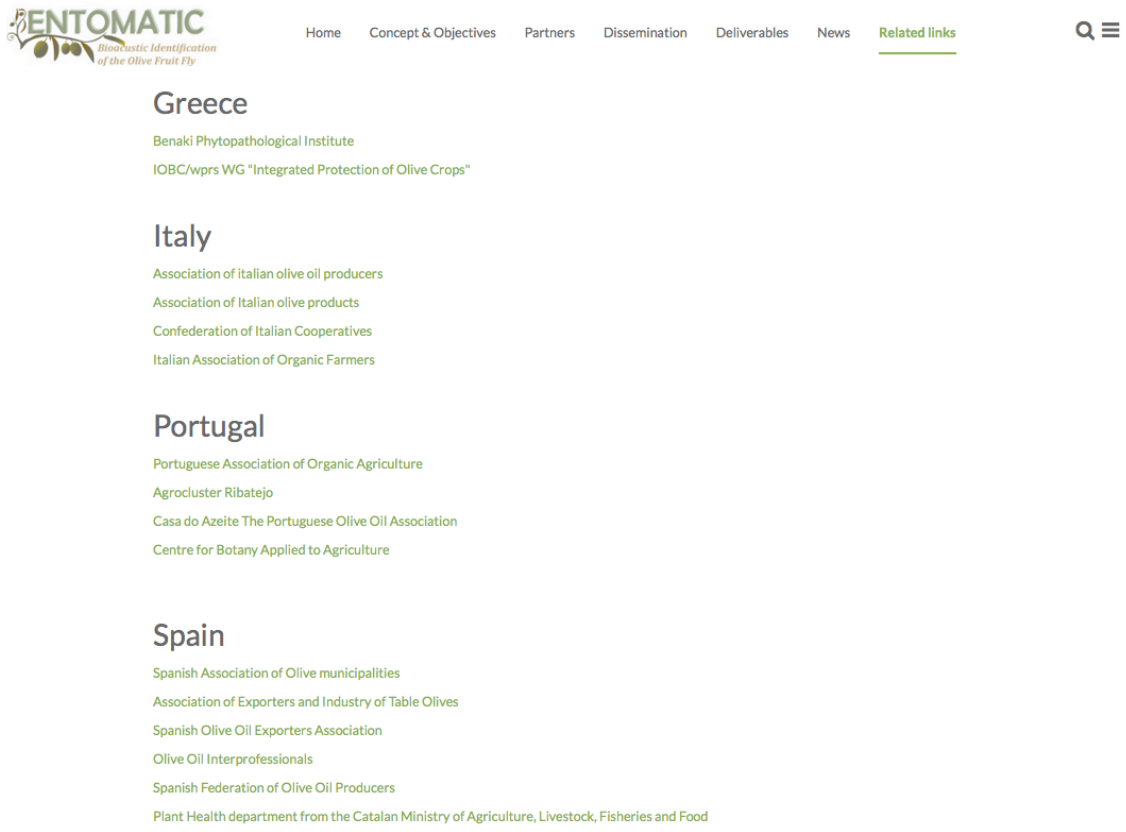

Figure 2.11: Related links page

3 TECHNOLOGICAL INFORMATION

Regarding the tools used to program the website, we follow the institutional tools provided by the IT services of the Universitat Pompeu Fabra.

The website manager is Liferay. Their main capabilities are:

''Liferay Portal is a free and open source enterprise portal software product. Distributed under the GNU Lesser General Public License and optional commercial license, Liferay has been declared "Best Open Source Portal" by InfoWorld in 2007. It is primarily used to power corporate intranets and extranets.

Written in Java, Liferay Portal is a web platform with features commonly required for the development of websites and portals. Liferay includes a built-in web content management system allowing users to build websites and portals as an assembly of themes, pages, portlets/gadgets and a common navigation. Liferay is sometimes described as a content management framework or a web application framework. Liferay's support for plugins extends into multiple programming languages, including support for PHP and Ruby portlets.

Although Liferay offers a sophisticated programming interface for developers, no programming skills are required for basic website installation and administration.

Liferay Portal is Java-based and runs on any computing platform capable of running the Java Runtime Environment and an application server. Liferay is available bundled with a servlet container such as Apache Tomcat.''[1]

The web page also follows a design based on the web responsive rules. This means, basically, that the web adapts its appereance to every device.

"Responsive web design (RWD) is an approach to web design aimed at crafting sites to provide an optimal viewing and interaction experience—easy reading and navigation with a minimum of resizing, panning, and scrolling—across a wide range of devices (from desktop computer monitors to mobile phones).

A site designed with RWD adapts the layout to the viewing environment by using fluid, proportion-based grids, flexible images, and CSS3 media queries, an extension of the @media rule, in the following ways:

- *The fluid grid concept calls for page element sizing to be in relative units like percentages, rather than absolute units like pixels or points.*
- *Flexible images are also sized in relative units, so as to prevent them from displaying outside their containing element.*
- *Media queries allow the page to use different CSS style rules based on characteristics of the device the site is being displayed on, most commonly the width of the browser.*

Responsive web design is becoming more important as the amount of mobile traffic now accounts for more than half of total internet traffic. This trend is so prevalent that Google has begun to boost the ratings of sites that are mobile friendly if the search was made from a mobile device. This has the net effect of penalizing sites that are not mobile friendly.''[2]

[1] Text extracted from Wikipedia https://en.wikipedia.org/wiki/Liferay
[2] Text extracted from Wikipedia https://en.wikipedia.org/wiki/Responsive_web_design