



SWAMP

SMART WATER MANAGEMENT PLATFORM

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WP6

D6.7 Internal Workshop on Innovation and Exploitation

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3	University of Bologna	UBO	IT
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Abbreviations

ICT	Information and Communication Technologies
IoT	Internet of Things
SWAMP	Smart Water Management Platform

Executive Summary

SWAMP (Smart Water Management Platform) is a Europe-Brazil cooperation project aiming at developing Internet of Things (IoT) based methods and approaches for smart water management in the precision irrigation domain and to pilot the approaches in four places, two pilots in Europe (Italy and Spain) and two pilots in Brazil. SWAMP aims at improving precision irrigation by increasing the awareness of the condition of the crop, by monitoring the field based on crop status (size, growing phase) and environment (e.g., weather forecast) and to adjust the irrigation prescription map accordingly. The smart water management pilots aim at guaranteeing that technological components are flexible enough to adapt to different contexts and to be replicable in different locations and settings. The same underlying SWAMP platform can be customized to different pilots considering different countries, climate, soil, and crops.

This document reports the organization and minutes of the SWAMP Internal Workshop on Innovation & Exploitation, held as a series of three online meetings during September and October 2018, where all partners contributed explaining their current perspectives on SWAMP innovation and exploitation. The workshop influenced the Exploitation Plan [3], a companion document that updates the initial partner exploitation plan that was presented together with the project proposal. The workshop was extremely successful in the sense that partners had an opportunity to show their current perspectives about the exploitation of SWAMP results and discuss their ideas with each other.

Perspectives and expectations about exploitation of SWAMP results are continuously evolving and since the project has now reached one third of its duration, new ideas will certainly come up during the next two years. As a matter of fact, during the workshop partners agreed that a new version of it should be conducted at the end of the project, to understand the changes and evolution of perspectives during two years. The final perspective of SWAMP partners will be reported in D6.6 Exploitation activity report due to the end of the project (month 36).

1. Introduction

1.1. Purpose and Context of this Deliverable

The primary objective of the SWAMP (Smart Water Management Platform) project is to develop IoT (Internet of Things) based methods and approaches for smart water management in the precision irrigation domain and to pilot the approaches in four places, two pilots in Europe (Italy and Spain) and two pilots in Brazil. The key challenges faced by SWAMP are:

- Automating advanced platforms and integrating different technologies and solutions;
- Reducing effort in software development by exploiting IoT, big data, cloud computing and artificial intelligence;
- Integrating heterogeneous sensors (also drones) for precision irrigation;
- Providing flexibility and adaptability to different contexts and locations.

SWAMP aims at improving precision irrigation by increasing the awareness of the condition of the crop, by monitoring the field based on crop status (size, growing phase) and environment (e.g., weather forecast) and to adjust the irrigation prescription map accordingly. The smart water management pilots aim at guaranteeing that technological components are flexible enough to adapt to different contexts and to be replicable in different locations and settings. The same underlying SWAMP platform can be customized to different pilots considering different countries, climate, soil, and crops.

The present document contains the minutes of the SWAMP Internal Workshop of Innovation and Exploitation, which is an output of Task T6.3 (Exploitation) within Work package 6 (Impact Creation Measures). The main goal of WP6 is to support the exploitation possibilities by ensuring that the results are as exploitable as possible, by highlighting the business possibilities and opportunities that will emerge from the project, and encouraging and supporting the creation and management of new knowledge and innovations.

The organization of the SWAMP Internal Workshop of Innovation and Exploitation was influenced by the European IPR Helpdesk handbook entitled "Fact Sheet: The Plan for the Exploitation and Dissemination of Results in Horizon 2020" [1] and by the European Commission Presentation on "Dissemination and Exploitation in Horizon 2020" [2], both available online.

1.2. Scope of this Deliverable

This document presents the minutes of the SWAMP Internal Workshop of Innovation and Exploitation held as a series of three online meeting during September and October 2018, where all partners contributed explaining their current perspectives on SWAMP innovation and exploitation. The workshop influenced the Exploitation Plan [3], a companion document that updates the initial partner exploitation plan that was presented together with the project proposal.

1.3. Deliverable Structure

The remainder of this document is organized in six chapters.

- Chapter 2 (Organization and Agenda of the Workshop) provides clarifications about the organization and agenda of the workshop.
- Chapter 3 (Workshop Minutes) contains the actual minutes of the three meetings.

- Chapter 4 (Highlights) presents highlights with selected findings from the Internal Workshop on Innovation and Exploitation
- Chapter 5 presents final thoughts about the workshop.

2. Organization and Agenda of the Workshop

During September and October 2018 SWAMP partners engaged in the Internal Workshop on Innovation and Exploitation (formally called Deliverable D6.7). This workshop was also due to month 12 of the project and is documented in a companion report. In the Workshop, all partners showed their current perspectives of possibilities, opportunities and barriers for the exploitation of SWAMP results, always followed by a series of questions and comments. Priority was given, understandably, to the commercial partners that will pursue the exploitation of results in the form of processes, products or services.

Exploitation aims at guaranteeing that significant project results survive after the end of the project. Thus, this workshop focused on driving the consortium members to achieve the goals established in the beginning of the project and to account for new needs, possibilities and opportunities. According to the European Commission, partners must take concrete measures to exploit project results in three different ways¹:

1. Using project results in further research activities, which are not covered by the project itself;
2. Developing and providing a product, process or service, which have a clear focus on the market;
3. Using project results in standardization activities and policy-making or advocacy actions.

Given the profile of SWAMP consortium members, both exploitation way number 1 (research, by academic partners) and number 2 (market, by business partners) will be explicitly pursued. Exploitation way number 3 (standardization and policy) will be pursued by all members based on the opportunities that might be found during the project. There are a variety of other end-users and stakeholders in general that are considered an important target audience of the project. In the SWAMP consortium, we count on various farmers (Intercrop, CBEC pilot farms, Guaspari Winery, Rio das Pedras Farm (MATOPIBA), a water distributor (CBEC), a drone manufacturer (Quaternium), a system integrator (LeverTech), two technology transfer institutions (VTT and EMBRAPA), and four universities as scientific partners (UNIBO, UFABC, UFPE, FEI).

The Workshop was conducted as a series of three online meetings in the GoToMeeting² conferencing system, each one lasting longer than 2 hours, thus amounting almost 7 hours of discussions and exchange of ideas. In total, 27 different people from all partners participated in one, two or three meetings of the workshop. The dates and agenda for each meeting is presented below that always starting at 9AM in Brazil, 2PM in Italy/Spain and 3PM in Finland.

- Meeting #1: Sep 19th 2018
 - Introduction (Carlos Kamienski, UFABC)
 - LeverTech perspective on SWAMP Innovation & Exploitation (Helder Gaudêncio)
 - Intercrop perspective on SWAMP Innovation & Exploitation (Jafar Golnabi)
- Meeting #2: Oct 2nd 2018
 - Introduction (Carlos Kamienski, UFABC)
 - CBEC perspective on SWAMP Innovation & Exploitation (Cinzia Carpi and Paola Zanetti)
 - EMBRAPA perspective on SWAMP Innovation & Exploitation (André Torre, Ednaldo Ferreira)

¹ ec.europa.eu/research/participants/portal/desktop/en/support/reference_terms.html

² gotomeeting.com

- Meeting #3: Oct 10th 2018
 - Introduction (Carlos Kamienski, UFABC)
 - VTT perspective on SWAMP Innovation & Exploitation (Juha-Pekka Soininen)
 - Quaternium perspective on SWAMP Innovation & Exploitation (Alicia Fuentes)
 - UFPE perspective on SWAMP Innovation & Exploitation (Ramide Dantas)
 - UNIBO perspective on SWAMP Innovation & Exploitation (Camilla Stanghellini)
 - FEI perspective on SWAMP Innovation & Exploitation (Rodrigo Filev Maia)
 - UFABC perspective on SWAMP Innovation & Exploitation (Carlos Kamienski)
 - Wrap-up (Carlos Kamienski, UFABC)

A list of nine questions helped presenters to organize their ideas about SWAMP innovation and exploitation:

- Q1) What type of exploitation can you do? (end user, technology provider, etc.)
- Q2) How well SWAMP fits into this partner business plan?
- Q3) How likely will this partner adopt SWAMP results?
- Q4) Which are the main difficulties/barriers for not exploiting SWAMP results?
- Q5) In which time frame do you think you could adopt SWAMP results?
- Q6) What innovation of SWAMP do you think will be more easily adopted by this partner and by the market in general?
- Q7) What suggestions do you give to make SWAMP results more easily exploitable?
- Q8) What suggestions do you give for creating higher impact on society?
- Q9) What else could you say about exploitation of SWAMP results?

3. Workshop Minutes

The minutes of the workshop are presented below, divided by each of the three meetings.

3.1. Meeting #1: Sep 19th, 2018

Attendance: the first meeting of the workshop had 14 attendees (in alphabetical order):

- Andre Torre (EMBRAPA)
- Camilla Stanghellini UNIBO
- Carlos Kamienski (UFABC)
- Fabrizio Borelli (UFABC)
- Helder Gaudêncio (LeverTech)
- Jafar Golnabi (Intercrop)
- Jeferson Cotrim (UFABC)
- João Kleinschmidt (UFABC)
- Juha-Pekka Soininen (VTT)
- Lorenzo Zingali (UNIBO)
- Luciene Rinaldi (FEI)
- Ramide Dantas (UFPE)
- Rodrigo Filev Maia (FEI)
- Tullio Salmon Cinotti (UNIBO)

The online virtual session lasted for 145 minutes and the presentations, questions, answers and general discussions are summarized below:

- Introduction (Carlos Kamienski, UFABC)
 - Motivation: The SWAMP proposal in the objectives and key results highlights the new business cases and models for farmers, water management and irrigation companies. Work Package 6 (WP 6 - Impact creation measures) explicitly mentions that one of its objectives is supporting the exploitation possibilities by ensuring that the results are as exploitable as possible, by highlighting the business possibilities and opportunities that will emerge from the project, and encouraging and supporting the creation and management of new knowledge and innovations. Task 6.3 is devoted to Exploitation of SWAMP results. Deliverable D6.5 must present the Exploitation Plan and Deliverable D6.7 is how is formally called the D6.7 Internal workshop on innovation and exploitation. Also, all partners presented their preliminary perspective on exploitation of SWAMP results in the proposal, as well as the prospective impact on their future activities. This calls SWAMP partners for the need of focusing not only on generating the expected results, but also on exploiting them so that the project achievements survive after it is over.
 - Innovation & Exploitation Potential: The TRL (Technology Readiness Level) of SWAMP is not homogeneous across every different aspect cover by the project, but in general terms it lies between 5 and 7, which means that it is not basic research as well as its final results will be not ready for the market. Therefore, additional effort will be needed for the results of the project to be useful for all stakeholders. The innovation potential for both the market and research communities is presented, as well as the envisioned target audiences and the types of end-users and exploitation possibilities within the SWAMP consortium.
 - Steps for Exploitation: According the European Blogactiv, there are 5 key steps for exploitation³: 1) Add end-uses and customers; 2) Delivering value; 3) Detailing business models, business cases and business plans (if it makes sense); 4) IPR agreements (covered by the coordination agreement and Deliverable D7.03); 5) Innovation Management.
 - SWAMP Exploitation by Partners: at the end, 9 questions for guiding the perspectives of SWAMP partners on innovation and exploitation were presented (listed in section 2)
- LeverTech perspective on SWAMP Innovation & Exploitation (Helder Gaudêncio)
 - Focus on experience: this presentation is the outcome of LeverTech's experience doing business for many years, rather than an academic view of exploitation
 - Exploitation objective for LeverTech is to take the SWAMP solution to the market, mainly Farmers and Irrigation Water Distribution Companies. The path is by the existing distribution channels, i.e., companies that sell irrigation products and services
 - Exploiting the results of a past project: LeverTech is now exploiting the results of a research project started 12 years ago with a Swedish partner company called Tannak that commercializes LoRa Gateways.
 - Functions: exploitation involves seven functions that must be adequately addressed: Installation and Training, Operations, Hosting, Management: FCAPS (fault-management, configuration, accounting, performance, security) and Service Level Management (SLA); Service Desk, Maintenance, Marketing, Sales.
 - Focus on sales: "No sales, no product; just a project". The most important information: is this product part of the acquisition list of customers (farmers)? If it is in the acquisition list of

³ <https://europamedia.blogactiv.eu/2017/12/04/exploitation-plans-five-key-steps-for-horizon-2020-proposals>

buyers, it means that the product is desired by the market. A success for the market is one can sell their products.

- Exploitation of SWAMP results: most farmers around Brasilia (where LeverTech is located) have two problems: water cost and scarcity. Irrigation amounts for up to 20% of the total production cost. Also, Brasilia is a dry area and most farmers are already using the total permitted water they can obtain from rivers.
- Intercrop perspective on SWAMP Innovation & Exploitation (Jafar Golnabi)
 - Complex system: the water distribution system is very complex in the south of Spain: involves government and private companies
 - Measure of success: if SWAMP shows good results that reduce their costs, the Intercrop board may be willing to invest in implementing it. Intercrop is a SME so that investments are not easily made. Despite that, they try adopting as much as possible new technologies in salad crops. Irrigation is not an exception. Intercrop was the first company to use sprinkler irrigation in the area for spinach and baby leaf crops. But the results are very important. They have to prove to the Intercrop board that there is a balance between pros and cons to make a decision: cost, yield, water saving, quality. Intercrop estimates that they can save 20% to 30% of water with a technology like SWAMP.
 - Adoption of results: with high probability Intercrop will use SWAMP results depending on how they can fit into their irrigation needs. Saving water has a big impact in their business because they are situated in a very dry area, so saving water is a must. Average rainfall is 200-300ml in this area, which requires irrigation. They need to save water.
 - Cost vs. scarcity: the problem of Intercrop is less the cost of water than scarcity of water. Weekly water distribution plan is unstable and decided overnight by the water company. Intercrop needs to save water to avoid shortage. On the other hand, cost is not a problem now because the price is fixed, but there is no guarantee that this policy will be maintained in the near future.
 - Support from vendors of irrigation equipment suppliers: they have very good support and technology, both sprinkler and drip irrigation. After Israel, probably the south of Spain is the second market in the world.
 - Difficulties/barriers for exploitation: the lack of experience in using precision irrigation system is a barrier. For example, they did not exploit the results of a past project because the results were not customized to Intercrop requirements and the solution was expensive and difficult to manage. A system like SWAMP needs trained people to operate it.
 - Creating impact in society: society will understand better the project if it focuses more on making a sustainable use of water, reducing the environmental impact of farming, compared to the conventional irrigation. If we want to impact the public opinion, we need to use the language that society likes, such as sustainable use of water compared to conventional irrigation.

3.2. Meeting #2: Oct 2nd, 2018

Attendance: the second meeting of the workshop had 20 attendees (in alphabetical order):

- Alessio Domeneghetti (UNIBO)
- Alexandre Heideker(UFABC)
- Andre Torre Neto (EMBRAPA)
- Brenno Tondato de Faria (FEI)
- Camilla Stanghellini UNIBO

- Carlos Kamienski (UFABC)
- Carlos Pusinho (EMBRAPA)
- Cinzia Carpi (CBEC)
- Ednaldo Ferreira (EMBRAPA)
- Eric Grassl (FEI)
- Giulia Villani (UNIBO)
- Jafar Golnabi (Intercrop)
- Juha-Pekka Soininen (VTT)
- Lorenzo Zingali (UNIBO)
- Luca Roffia (UNIBO)
- Luciene Rinaldi (FEI)
- Paola Zanetti (CBEC)
- Plinio Aquino (FEI)
- Rafael Gomes Alves (FEI)
- Ramide Dantas (UFPE)

The online virtual session lasted for 122 minutes and the presentations, questions, answers and general discussions are summarized below:

- Introduction (Carlos Kamienski, UFABC)
 - Welcome and reminder of the purpose of the workshop
- CBEC perspective on SWAMP Innovation & Exploitation (Cinzia Carpi and Paola Zanetti)
 - Overview of CBEC: area of 312,700 Hectares covering five provinces (Reggio Emilia, Modena, Parma, Mantua and Massa Carrara) and 65 municipalities, both in the plain and in the mountains. In the mountains, the work is basically performing territory surveillance and safeguard, such as dealing with and preventing erosion and flooding. In the plain, work involves collection, viability until final discharge in rivers, maintenance and management of precipitation water (drainage and bank curbing); collection of water coming from residual water drainage; diversion and distribution of water for irrigation purposes.
 - Management: ensuring environmental and territorial safety and water supply for irrigation takes constant soil defense and maintenance, as well as water regulation, so as to avoid worsening the instability and environmental degradation and reduce the land vulnerability: in one word, it requires a high management effort.
 - Outcomes of SWAMP exploitation: immediate outcomes include the functioning of water management evaluating present management modes and highlighting bottlenecks, as well as verifying whether the introduction of new technologies could contribute to solve the identified bottlenecks and whether it could also lead to the identification of new management rules. Future outcome may allow the development of different ways of managing water resources to be further extended to other hydraulic basins.
 - How SWAMP fits into the CBEC business plan: the management of water resources is one of CBEC fundamental functions, and therefore all activities aimed at the improvement of water resources management, their shrewd use, their protection and enhancement are part of our core business.
 - Adoption of SWAMP results: since the project is still in an initial phase, results are not developed and reached yet, thus it is not still possible to confirm the project expectations. Some factor may cause difficulties in the adoption of SWAMP by CBEC
 - Prototype still under construction (not proven)
 - A considerable number of sensors and automatic water management systems is needed to monitor hydric networks and irrigation fields

- Initial installation costs are considerable, and future advantages may be worth this cost
 - Availability of a huge amount of data, requiring further management and validation
 - The goal of CBEC in SWAMP is saving water. Also, they have to meet the requirements coming from farmers, particularly in Summer.
- EMBRAPA perspective on SWAMP Innovation & Exploitation (André Torre, Ednaldo Ferreira)
 - EMBRAPA operates all over Brazil in distributed units, which are related to products, such as cotton, soybeans and cattle. EMBRAPA has a partnership with a recently created Brazilian agency for rural attention (ANATER - National Agency on Technical Assistance and Rural Extension). Knowledge is the business of EMBRAPA, focused on hardware solutions, software solutions and methods.
 - Technology transfer: EMBRAPA works with research & development mostly for technology transfer. EMBRAPA has collaborative projects with about 80% of universities in Brazil. Collaborations are also established with companies, such as with the Fockink company that manufactures the center pivot for the MATOPIBA farm; EMBRAPA is establishing a cooperation agreement with Fockink for developing a solution based on Variable Rate Irrigation (VRI), and agreement that is about to be signed, which is one way EMBRAPA considers the results of SWAMP to be exploited.
 - Dissemination and Exploitation: different initiatives exist within EMBRAPA for the dissemination of project results to encourage the technology transfer and exploitation by new partners: a) "Special Days" are an opportunity for demonstrating the SWAMP perspective; b) Opportunity to go to fairs and events: to present results to the general public, both agriculture and ICT ones. Most popular fairs: Agrishow; IrrigaShow, and Bahia Agrishow that is close to MATOPIBA. c) Technology showcase is an exhibition especially prepared for visitors.
 - Mind map of SWAMP exploitation: used for visually organizing information, the EMBRAPA mind map shows SWAMP results supported by high tech startups and agritech companies. It does not consider SWAMP as a unique solution, but rather as a solution suite. In each layer of the architecture, solutions might have a particular TRL to be exploited by different companies and startups. Fockink is an example of a high-tech company that may exploit SWAMP results.
 - Relationship of EMBRAPA with companies and startups: usually companies come to EMBRAPA to obtain new technologies. As soon as the SWAMP project was advertised, many companies approached EMBRAPA to get more information and to understand how they could benefit from it. In the case of Fockink, they want to provide both a VRI kit and an integrated solution to their center pivots. Experience shows that it is easier to partner with startups and SMEs than with big companies. EMBRAPA has currently about 15 agreements with startups
 - Exploitation by the Brazilian pilots
 - MATOPIBA: farmer was very positive regarding the adoption of SWAMP solution, mainly if it can obtain the same results shown by an experiment using VRI in the University of Georgia (USA). The plot was divided into strips, which alternatively were irrigated with variable rate and the conventional method of fixed rate. Yields were approximately the same, but VRI used 50% less water. In MATOPIBA, the cost of irrigation (energy) represents 30% of the total production cost, so that the farmer was very attracted to this idea.
 - Guaspari: farmers had similar reactions, but with the goal of improving the quality of wine. Luiz Bassoi has been working with the winery for some years and he has good

results and as soon as we have SWAMP platform running, we might help improving wine quality. It is a matter of showing farmers that it works.

3.3. Meeting #3: Oct 10th, 2018

Attendance: the third meeting of the workshop had 13 attendees (in alphabetical order):

- Alessio Domeneghetti (UNIBO)
- Alicia Fuentes (Quaternium)
- Andre Torre Neto (Embrapa)
- Camilla Stanghellini UNIBO
- Carlos Kamienski (UFABC)
- Ednaldo Ferreira (Embrapa)
- Juha-Pekka Soininen (VTT)
- Luca Roffia (UNIBO)
- Lorenzo Zingali (UNIBO)
- Ramide Dantas (UFPE)
- Rodrigo Filev Maia (FEI)
- Tullio Salmon Cinotti (UNIBO)
- Jafar Golnabi (Intercrop)

The online virtual session lasted for 137 minutes and the presentations, questions, answers and general discussions are summarized below:

- Introduction (Carlos Kamienski, UFABC)
 - Welcome and reminder of the purpose of the workshop
- VTT perspective on SWAMP Innovation & Exploitation (Juha-Pekka Soininen)
 - Main results and innovations from VTT perspective: a) automated decision-making based on situation-awareness and artificial intelligence in a very complex system; b) automated data collection from large area (with the help of autonomous systems and gateway mobility); c) SWAMP platform (and platform development principles).
 - End users and customers: CPS developers (generic competence related to CPS development, IoT, AI, cloud platforms) and companies making water management related devices, appliances and systems.
 - Delivering value: the main type of exploitation is that VTT develops the SWAMP technology further (from current TRL 5 or 6 to TRL 8 and 9) together with industrial partners. The development can be done either with help of public funding or as contract research project with customer. The end product will be owned by the partner. (Very similar to EMBRAPA's model). A second alternative is to set up a start-up (or spin-off) that start to commercialize the technology. VTT can be a partner in the start-up. Raising awareness of IoT/AI as a solution for intelligent water management in water related events and forums.
 - Business case: a) high competition in precision irrigation, but SWAMP has differentiating approach with its way of mashing up various information sources and connecting AI into decision process b) the idea of studying both plant's capability to use water via hyperspectral cameras and water potential of soil via IoT based approach is novel; c) linking of irrigation both to natural water cycle and water reservoir status gives added value; d) totally autonomous drones carrying multiple tools, and using drone as a platform for data collection from very low-cost disposable sensors may develop into very interesting innovation. Now the TRL is very low.

- IPR agreements and innovation management: during the SWAMP open innovation principles are followed and after project developments VTT's own practices will be used. SWAMP implements the basic innovation and knowledge management tasks appropriate for such a project. Maximizing the full exploitation potential would need significant increase in crop types and interaction with different farming practices.
- Future projects and business plan: VTT will definitely use competences and results of SWAMP in its future projects. SWAMP fits in perfectly to VTT business plan.
- Suggestions: a) more effort need to be put on communicating the pilots to possible users, developers and policy makers; b) environmental aspects should be emphasized and enabling fairness in using our common water resources; c) expanding the project scope (i.e. platform applicability) to other water management areas; d) put more effort on thinking about how the results will be developed from TRL 6 onwards after the project. We should start to implement the business ecosystem by creating more links with companies.
- Quaternium perspective on SWAMP Innovation & Exploitation (Alicia Fuentes)
 - Exploitation: Quaternium has problems in defining exploitation of SWAMP results and how much money customers will save by using those solutions. It is early to assess how much value this adds to drone business. Quaternium is a drone startup that currently is exploring different possibilities and markets to exploit its technology. Precision farming is expected to be the main market in the drone industry, therefore, according to their business plan, Quaternium is highly interested in studying this potential market. However, an open and affordable drone might complicate commercialization.
 - Integration: everything must be integrated, i.e., there is no business with just the drone. Quaternium is a hardware company which makes it more difficult to exploit the results than services.
 - Adoption: in terms of the drone functionality, it is very likely that Quaternium adopts SWAMP results. Meanwhile, the adoption of the results regarding other aspects will depend on, feasibility study of the project, partners agreement and pilot programs results. Quaternium values the integration of sensors as well as the innovative features of the drone. Market may value the app and the data cloud, provided that its usability is effective.
 - Barriers: It might not be profitable. The offered technology may not provide sufficient improvements to the field. Also, conservatism of end users might prevent them from realizing the benefits of such technology.
 - Cost vs. value: rather than cost, they must think about added value; once you get closer to the market, things get more expensive. Value, value and value: what is important is how much value SWAMP provides.
 - Drone ecosystem: is unstable, which makes it difficult to know right now what is going to work in the future, because customers are buying for trials, not for operations. Quaternium started in hobby markets, then semi-professional (commercial filming and inspecting; difficult to compete with Chinese company); then they changed to bigger customers; target markets are energy, surveillance companies, fleets of drones, etc.
 - System integrators: someone should assist the farmers. Quaternium is partnering with intermediaries that can take more risks and have access to big companies.
 - Suggestions: to work in the app and the data cloud usability, which can add more value to the service. The app and the data cloud should be available for both the service provider and the end-user.

- Societal impact: maintaining the project open-source plus releasing information about water efficiency to the general public can help to empower citizens and therefore to: a) raise awareness about the high percentage of water used in agriculture compared to private consumption; b) generate a social pressure, consequence of such awareness, which can help involve the government into improving their water efficiency policy; c) involve more countries and/or regions.
- UFPE perspective on SWAMP Innovation & Exploitation (Ramide Dantas)
 - Key exploitation: making more research projects, new avenues for research, theses, dissertations. Once the SWAMP platform is running we can create more applications. Interested in performance analysis that can generate a lot of research and publications; besides that they have more opportunities with data that is available in the platform to exploit more models (analytics).
 - There is also the interest for the region where UFPE is located. The Northeast of Brazil is a semiarid area with a chronic problem of water scarcity. Must go after public agencies to promote the adoption of the platform. Since water scarcity is a long lasting problem, policy and advocating must be undertaken. Recife is a tech hub where they might find companies to exploit the results.
- UNIBO perspective on SWAMP Innovation & Exploitation (Camilla Stanghellini)
 - Outcome: working with a multidisciplinary team (computer science, agronomy, hydrology) has been extremely profitable in terms of opportunities for further exploitation, for example, cooperation in publications. Each department has the possibilities to expand its range of actions and they are already taking part in new proposals.
 - Collaboration: UNIBO is experiencing a very fruitful cooperation with CBEC and that can lead to exploitation in the education field, such as internships and PhD. Also, cooperation with André (EMBRAPA) in the sensor manufacturing.
 - Integration of data from drones coming from multispectral cameras.
 - They can create a new company, a spin-off, and CBEC might do that for optimization of irrigation scheduling.
- FEI perspective on SWAMP Innovation & Exploitation (Rodrigo Filev Maia)
 - Focus of exploitation in water management. Right now there is a PhD student at FEI working with açai berry (a Brazilian fruit). Previously açai was obtained by extractivism, but since two year ago, there are açai farms in Brazil and they have different business models using IoT and they are willing to understand how such platform could be used in setting.
 - A new project is being negotiated with an employee of SABESP (urban distribution state-owned company) to use the IoT Robot in a scenario beyond irrigation.
 - Industry 4.0: a new avenue for exploitation of SWAMP IoT-based results in a different area.
- UFABC perspective on SWAMP Innovation & Exploitation (Carlos Kamienski)
 - Exploitation: being a university, it is more likely that UFABC will use SWAMP results "in further research activities " (using the terminology of the European Commission).
 - SWAMP Platform based on the FIWARE Platform: may be used in a variety of different projects.
 - Smart models and algorithms for precision irrigation
 - Wireless Technologies for IoT-based Smart Farming
 - Fog-Cloud Integration in IoT-based Smart Applications
 - Smart Farming, Precision Agriculture and working with agriculture and farming in general: being an urban university focused on engineering, it is more natural for UFABC to focus on industry since the ABC is the most industrialized area in Brazil. Research in agriculture is rare, but SWAMP opens up the possibility of new project in this important area for Brazil and for the whole world
 - Collaboration: new EU-BR projects or bilateral collaboration with SWAMP partners

- Workshop Wrap-up (Carlos Kamienski, UFABC)
 - Special thanks to all the participants.
 - Minutes of the workshop will be reported in Deliverable D6.7.
 - Participants agreed that a new workshop focused on innovation and exploitation should be conducted by the end of the project for summarizing the final view of SWAMP members.

4. Highlights

This section presents highlights with selected findings from the Internal Workshop on Innovation and Exploitation, which may influence further exploitation activities within the SWAMP project.

- Exploitation means to take a solution to the market, and the path is using existing distribution channels, i.e., companies that sell irrigation products and services.
- "No sales, no product; just a project". An important information: is this product part of the acquisition list of farmers?
- if SWAMP shows good results that reduce their costs and fit in their irrigation needs, companies might invest for implementing it. There must be a balance between pros and cons to make a decision: cost, yield, water saving, quality.
- Society will understand better the project if it focuses more on making a sustainable use of water, reducing the environmental impact of farming, compared to the conventional irrigation.
- Adoption of SWAMP results will depend on costs, because a considerable number of sensors and automatic water management systems is needed to monitor hydric networks and irrigation fields. Initial installation costs is considerable, and future advantages may be worth this cost.
- SWAMP should not be considered a unique solution, rather, a solution suite. Each layer of the architecture might be exploited by different companies and startups. Also, experience shows that it is easier to partner with startups and SMEs than with big companies.
- The current TRL of SWAMP, around 5 and 6, should be moved towards 8 and 9 by establishing partnerships with industrial partners, either with public funding or funded by a customer.
- SWAMP should start to implement the business ecosystem by creating more links with companies.
- For a hardware company it is more difficult to exploit the results of such a project, compared to a service provider, because farmers need assistance. A small company must partner with intermediaries that can take more risks and have access to big companies.
- Semiarid regions where water scarcity is chronic may be benefited by SWAMP results, but it is necessary to advocate it to public agencies in order to influence public policy.
- New EU-BR projects or bilateral collaboration with SWAMP partners are expected as an exploitation of the project.

5. Final Remarks

The workshop was extremely successful in the sense that partners had an opportunity to show their current perspectives about the exploitation of SWAMP results and discuss their ideas with each other. Another positive outcome of the workshop is the influence in the Exploitation Plan [3], a companion document that updates the initial partner exploitation plan that was presented together with the project proposal.

Perspectives and expectations about exploitation of SWAMP results are continuously evolving and since the project as now achieved one third of its duration, new ideas will certainly come up during the next two years.

As a matter of fact, during the workshop partners agreed that a new version of it should be conducted at the end of the project, to understand the changes and evolution of perspectives during two years. The final perspective of SWAMP partners will be reported in D6.6 Exploitation activity report due to the end of the project (month 36).

References

- [1] European IPR Helpdesk, "Fact Sheet: The Plan for the Exploitation and Dissemination of Results in Horizon 2020", www.iprhelpdesk.eu, July 2015, https://www.iprhelpdesk.eu/sites/default/files/newsdocuments/FS-Plan-for-the-exploitation-and-dissemination-of-results_1.pdf
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- [3] Kamienski, C., Gaudêncio, H., "Exploitation Plan", SWAMP Deliverable D6.5, October 2018.