



SWAMP

SMART WATER MANAGEMENT PLATFORM

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WP6

D6.6 Exploitation Plan

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2	Intercrop	ICRO	ES
3	University of Bologna	UBO	IT
4	Consorzio di Bonifica dell'Emilia Centrale	CBEC	IT
5	Quaternium	QUAT	ES
6 (Brazilian Coord.)	Federal University of ABC	ABC	BR
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10	Brazilian Agricultural Research Corporation	EMBR	BR

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Abbreviations

ICT	Information and Communication Technologies
IoT	Internet of Things
SWAMP-IG	SWAMP Interest Group
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 presents an up-to-date view of SWAMP exploitation according to the partners experience over the first year of the project. Particularly, it focuses on the target audience and innovation potential, and, based on the Internal Workshop on Innovation and Exploitation, updates the initial exploitation plan of individual partners. It is an output of Task T6.3 (Exploitation) within Work package 6 (Impact Creation Measures), whose main goal is to ensure 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. Given that SWAMP deals with very important technological concepts (such as IoT, big data analytics, cloud computing and drones) as well as increasing the productivity, reducing costs and decreasing environmental impact in agriculture, it has been already attracting a lot of attention from different stakeholders. Therefore, the potential for exploitation might be very high.

Exploitation planning aims at guaranteeing that significant project results survive after the end of the project. Thus, the SWAMP Exploitation Plan documented in this report focuses on driving the consortium members to achieve the goals established in the beginning of the project. Partners must take concrete measures to exploit project results in three different ways: 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 will be found during the project.

This deliverable provides an overview and purpose of exploitation within the SWAMP project, identifies the SWAMP key target audiences regarding exploitation and highlights innovation potential of the project. Also, it presents an overview of the SWAMP Internal Workshop on Innovation & Exploitation and based on that it combines the initial exploitation plans of each partner with its current perspective on the subject exposed in the workshop. Also, it introduces the concept of SWAMP Interest Group (SWAMP-IG) aimed at bringing together potential end-users and stakeholders and providing them in first hand news about project results that may be worth exploiting.

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 is an output of Task T6.3 (Exploitation) within Work package 6 (Impact Creation Measures), whose main goal 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.

This document was influenced by the European IPR Helpdesk handbook entitled "Fact Sheet: The Plan for the Exploitation and Dissemination of Results in Horizon 2020" 18[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 key exploitation strategies for the expected outcomes of the SWAMP project, which are based on the initial exploitation plan added to the proposal, but also on the outcomes of a recently conducted Internal Workshop on Innovation and Exploitation. The minutes of the workshop itself are reported in a companion document [7], but are summarized here.

Also, Innovation and IPR management is involved with exploitation, but those issues are dealt with by another companion document and are not directly mentioned here.

The final perspective of SWAMP partners will be reported in D6.5 Exploitation activity report due to the end of the project (month 36).

1.3. Deliverable Structure

The remainder of this document is organized in six chapters.

- Chapter 2 (Exploitation Purpose and Overview) introduces the purpose of exploitation in SWAMP and provides an overview of the pilots, partner profiles and types of exploitation.
- Chapter 3 (SWAMP Target Audience and Innovation Potential) describes the current view of prospective target audience for the project results and exploitation, as well as innovation potential that can be generated by the activities involved in its execution.
- Chapter 4 (SWAMP Internal Workshop on Innovation & Exploitation) provides an overview of this workshop, whose minutes are presented in another companion document.

- Chapter 5 (Individual Partners Exploitation Plan) combines the initial exploitation plans of each partner with its current perspective on the subject recently exposed in the workshop.
- Chapter 6 (SWAMP Interest Group) describes the group to be created aimed at bringing together potential end-users and stakeholders and providing them in first hand news about project results that may be worth exploiting.
- Chapter 7 (Final Remarks) presents the final thoughts about exploitation activities in SWAMP.

2. Exploitation Purpose and Overview

SWAMP develops and assesses an IoT-based smart water management platform for precision irrigation in agriculture with a hands-on approach that focuses on pilots in Italy, Spain and Brazil. It becomes clear that even though more basic research and development will be undertaken in the project, there is a clear focus on experimentation and piloting. The proof of concept scenarios are realistic and involve end-users, stakeholders and businesses since the conception of the project, i.e., the Technology Readiness Levels (TRLs) are closer to the market, even though at a prototype scope. A straightforward corollary of the above statements is that the exploitation of SWAMP results is clearer to the consortium and effort must be done to make a good use of this opportunity.

The four SWAMP pilots are based on the similar technical solutions and deal with different crops and have different primary goals.

- CBEC Pilot (Bologna/Italy): the main objective of the Consorzio di Bonifica Emilia Centrale (CBEC) pilot is optimizing water distribution to the farms.
- Intercrop Pilot (Cartagena/Spain): Intercrop Iberica addresses several challenges since production is in a dry area, and a considerable amount of water comes from a desalination plant. The primary goal for Intercrop is using water more rationally.
- Guaspari Pilot (Espírito Santo do Pinhal / Brazil): The Guaspari Winery transfers the wine grape harvesting to the winter season (June-August) using irrigation techniques. The main goal for Guaspari is improving wine quality.
- MATOPIBA Pilot (Barreiras/Brazil): The Rio das Pedras Farm is located in the MATOPIBA region, and irrigation is mostly performed by center pivots. This main pilot goal is to implement and evaluate a smart irrigation system based on Variable Rate Irrigation (VRI) for center pivots in soybean production and save energy used in irrigation.

The composition of the SWAMP consortium also reflects the focus on exploitable results. Four out of ten partners of the SWAMP consortium belong to the business sector that in some way are directly involved with the exploitation of the results as far as the commercialization of products and services is concerned. Two partners are state-owned research oriented companies whose mission is to help the industrial sector to advance using new technologies and provide technology transfer services to them. Finally, four partners are universities well connected with the current state of the art and technique for providing the knowledge substrate for boosting the results.

Exploitation planning aims at guaranteeing that significant project results survive after the end of the project. Thus, the SWAMP Exploitation Plan documented in this report focuses on driving the consortium members to achieve the goals established in the beginning of the project. 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.

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

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 will be found during the project.

Exploitation of SWAMP results will focus on both direct and indirect results. The focus on reducing water consumption for irrigation is in itself a very important direct result for the humankind as water is expected to become a scarce resource in the near future. The sustainability of the planet will increasingly rely on actions for reducing the footprint of activities that are needed for providing better quality of life (like food security) for everyone. Also, water is vital for ensuring food security to the world's population, and agriculture is by far the biggest consumer amounting to 70% of freshwater [3]. Even though today the cost of water is small, it is expected to rise in the future. Also, irrigation requires the use of energy that amounts for as high as 30% of the total production cost in some areas, such in the MATOPIBA pilot in Brazil. Another direct result is highlighted by the Guaspari pilot in Brazil, where the objective is to improve the quality of wines by understating the soil, vineyards and grapes resulting from a precision irrigation process based on advanced technology such as IoT and artificial intelligence.

3. SWAMP Target Audience and Innovation Potential

In addition to the SWAMP partners mentioned in section 2 that will play an important role in the exploitation of results and indirectly via awareness creation, there are a variety of other end-users and stakeholders in general that are considered an important target audience of the project. The most significant are described below:

- Developers of IoT Systems: The key contribution of the SWAMP project is the platform for smart water management, particularly for precision irrigation in agriculture. The same underlying SWAMP platform can be customized to different pilots considering different countries, climate, soil, and crops. The SWAMP architecture may be implemented in a range of deployment configurations involving the use of smart algorithms and analytics in the cloud, fog-based smart decisions located on the farm premises and possibly mobile fog nodes acting in the field (e.g., drones or in the central pivot irrigation mechanisms). Given that the TRL level of the SWAMP platform in the end of the project will lie between 6 and 7, it becomes clear that further advancement is needed in order for it to be ready for the market. Therefore, there will be plenty of room for developers of IoT systems to exploit the SWAMP platform.
- Developers of IoT Platforms: The widespread availability of IoT-based applications requires adequate platforms for both development and operation phases. The former for releasing developers from the need of mastering different technologies outside their core business and that do not add value to the process. The latter for freeing organizations from the need of deploying and testing customized platforms for supporting the operation of IoT-based applications. There are some IoT platforms available today, both open source and proprietary. Remarkably, FIWARE² has been attracting general attention for being a worldwide open source solution fostered and funded by the European Commission under Horizon 2020 program. It is comprised of a series of software components called Generic Enablers (GE) that perform functions needed in a different variety of IoT-based applications for smart societies, focusing in cities, farming, industry, healthcare and sustainability. As the SWAMP platform is based on FIWARE IoT Platform, the availability of the SWAMP Platform itself will result in new exploitation opportunity for the FIWARE community.
- Vendors of IoT Solutions: The IoT realm comprises a large set of software and hardware vendors that may be willing to integrate their solutions with an IoT-based platform for smart agriculture such as SWAMP. This also includes drone manufacturers.

² fiware.org

- System Integrators: System integrators combine different solutions and bundle them so that they make sense to the end-users. When it comes to the exploitation of SWAMP results, system integrators will have to provide seamless connectivity of the software platform with a variety of different technologies, comprising sensors, wireless communication devices, irrigation systems and drones.
- Agritech Companies: Companies that provide services highly based on agriculture technologies are expected to benefit from the results of SWAMP. In this way, Agritech (or Agtech) companies can exploit the results of SWAMP not only for using them in precision irrigation, but also in a variety of different farming activities such as livestock, forestry and pisciculture.
- Farmers: The natural end-users of the SWAMP platforms are farmers, who are expected to extract most value from the precision irrigation application for smart water management. However, since SWAMP will deliver pilots and prototypes that are not ready for the market, its adoption will depend on companies that embrace the case and market the solution. Farmers need to be sure that the results will be achieved and that they will be benefited by adopting such a platform that might require significant investments.
- Water Distributors: In many parts of the world irrigated agriculture depends on water coming from sources that are farther away from them and must be carried closer to the crops through a network of pipes or canals that drive water taken from different sources, such as rivers, lakes or desalination plants. The optimization of water distribution is depended on accurate information regarding water needs that generates an irrigation prescription map and makes it available to the farmer.
- Government Policy Makers: Government agencies in charge of regulating the use of water, such as the Brazilian National Water Agency (ANA)³ and the European Environment Agency⁴, might be interested in the results of SWAMP project, given that they may point out opportunities for saving freshwater and contributing for the sustainability of the planet. For example, among the responsibilities of the Brazilian ANA are granting of rights to the use of water resources, inspection to assure that the grants are effectively respected and charge for use of the water. In case expected that the results of SWAMP provide significant evidence that technology decreases the use of water, changes in law may be pursued to promote the adoption of such solution by farmers.
- Technology Transfer Institutions: Different institutions around the world, usually state-owned, are devoted to understand, depict, use, simplify and finally transfer new technologies to developers, vendors, integrators and end-users.
- Scientific Community: Sound scientific results may influence further research projects and highlight different new research challenges. Therefore, the results of SWAMP may be at a large extent exploited by the scientific community.
- Standardization Bodies: Results of the SWAMP project in IoT-based solutions for smart water management may be used by standardization bodies to drive new standards that will provide interoperability among hardware and software technologies that may have the effect of expanding the market and showing its cost-effectiveness.

As for the SWAMP consortium members, 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 research and technology transfer institutions (VTT and EMBRAPA), and four universities as scientific partners (UNIBO, UFABC, UFPE, FEI).

The potential for innovation that may be exploited from the results of the SWAMP project involves all possible categories of stakeholders listed above, which may be condensed into the three ways mentioned in section 2: market, research, and policy/standards

³ www3.ana.gov.br/portal/ANA/portal-ingles

⁴ www.eea.europa.eu/themes/water

- Market Innovation Potential: related to the development and providing a product, process or service, which have a clear focus on the market;
 - Offering of new technologies for irrigation: varying from different hardware components, communication devices and software components, already discussed here.
 - Reduction of inefficiencies and increase in productivity: this is the key objective of the SWAMP project, i.e., to decrease the use of resources (water, energy, manpower) to provide gains in productivity.
 - Contribution to the sustainability of the planet: given the current and future predicted scarcity of water in the planet [5], making a rational use of this precious resource will be increasingly a significant target for different projects involved with research and development activities.
 - New business models for smart water management: the availability of a smart water management platform that seamlessly integrates to different hardware and communication means may play a significant role in the emergence of new business models. For example, a model where different stakeholders consume anonymized data from a public platform that may be used for different purposes, upon the payment of a certain fee.
- Research Innovation Potential: related to the use of project results in further research activities, which are not covered by the project itself;
 - Integration of various technologies in a single adaptable platform: the key scientific results of the SWAMP project dwells in integrating different technologies, rather than in creating new ones.
 - Development of smart analytical algorithms for irrigation in agriculture: there are different traditional models developed by agronomists over the last decades. However, with the emergence of analytical models based on computational intelligence methods, such as machine learning and deep learning, the algorithm learns how to prescribe the irrigation map based on a huge amount of data, also the results of the old models [4].
 - Effective use of drones in irrigation: SWAMP will test two uses for drones as flying sensors or sensing systems in agriculture. Firstly, as a moving container of cameras of different types, such as thermal, multispectral or hyper-spectral, as emphasized by a recent book edited by FAO and ITU [6]. Also, a data mule in case of lack of wireless communication between sensors and the IoT platform.
 - Exploration of new opportunities in irrigation management: Irrigation management systems - such as drip, sprinkler and central pivot ones – may be improved as a result of the findings of the SWAMP project.
- Standard/Policy Innovation Potential: related to the use of project results in standardization activities and policy-making or advocacy actions.
 - Contribution to improve policy: as mentioned above, government agencies in charge of water use regulation may use the results of the project to change laws in order to foster the adoption of such solutions by farmers.
 - Contribution to new standards: as mentioned above, results of the SWAMP project in IoT-based solutions for smart water management may be used by standardization bodies to drive new standards.

4. SWAMP Internal Workshop on Innovation & Exploitation

During September and October 2018 SWAMP partners engaged in the Internal Workshop on Innovation and Exploitation (formally called Deliverable D6.7), which influenced this Exploitation Plan. This workshop was also due to month 12 of the project and is documented in a companion report [7]. In the Workshop, all partners showed their current view of possibilities, opportunities and barriers for the exploitation of SWAMP results.

The Workshop was conducted as a series of three online meetings each one lasting longer than 2 hours, thus totally almost 7 hours of discussions and exchange of ideas among partners about this subject. The dates were Sep 19th 2018 for meeting #1, Oct 2nd 2018 for meeting #2 and Oct 10th 2018 for meeting #3, always starting at 9AM in Brazil, 2PM in Italy/Spain and 3PM in Finland. All partners presented their perspectives, which were always followed by a series of questions and comments.

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?

Highlights from the workshop with selected findings that may influence further exploitation activities within the SWAMP project, are presented below.

- 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". 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 are 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, but rather, a solution suite. In each layer of the architecture, solutions might have a particular TRL to 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 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 a exploitation of the project

5. Individual Partners Exploitation Plan

Almost two years have elapsed since the SWAMP proposal was written and during the first year of the project partners have had the opportunity of learning and obtaining new insights about the challenges and opportunities of developing and piloting a smart water management platform for precision irrigation in agriculture. Also, the interaction with other partners created a positive synergy that improved the mutual perspectives based on each other opinions and experiences. Therefore, here we presented in initial exploitation plan of all partners side by side with highlights taken from their current view presented in the Internal Workshop on Innovation and Exploitation. The most appropriated exploitation strategies and business cases for the results of SWAMP are yet not entirely clear for the partners, so that we consider this the current view and not the final one. As a matter of fact, as a result of the workshop, partners agreed that a final workshop on innovation and exploitation will be conducted by the end of the project, so that we can exchange our more informed views with each other and document it accordingly.

TABLE 1 clearly shows an evolution of partner's perspectives on SWAMP innovation, which was more generic in the initial exploitation plan and now starts to be more specific and focused.

TABLE 1: SWAMP EXPLOITATION BY PARTNERS: INITIAL PLAN AND CURRENT PERSPECTIVES

Partner	Initial exploitation plan (proposal)	Highlights from the Workshop (D6.7)
VTT	VTT is a non-profit organization specialized in producing advanced technology through research. VTT will license the IPR of the technologies produced in SWAMP to industrial partners in Finland. Being a research centre, VTT is also interested in the scientific and academic exploitation of the results. The SWAMP project will boost the technical know-how of VTT in the field of IoT and the use of IoT in different domains. VTT will publish the results of the research in the scientific and industrial communities.	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) The main type of exploitation is to develop the SWAMP technology further (from current TRL 5 or 6 to TRL 8 and 9) with industrial partners. The development can be done either with help of public funding or as contract research project with customer. A second alternative is to set up a start-up to commercialize the technology. VTT will definitely use competences and results of SWAMP in its future projects. SWAMP fits in perfectly to VTT business plan.
ICRO	Intercrop is a producer of fresh vegetables and it will implement the Spanish pilot of the SWAMP. The system will be used in different crops and different time of year so the company will compare the results with proper and conventional methods to improve water and irrigation management. Intercrop is aiming to use the latest technology for water distribution and management to reduce the costs and to be more competitive in the market. SWAMP will continue to be used in the company due to the fact that it will be very effective	if SWAMP shows good results that reduce their costs, the ICRO board may be willing to invest in implementing it. Intercrop is a SME so that investments are not easy made. Despite of that, they try adopt as much as possible new technologies in salad crops. The Intercrop board must see that there is a balance between pros and cons to make a decision: cost, yield, water saving, quality. With high probability ICRO 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

	on saving water, reduce waste, reduce contamination of aquifers, yield and shelf life increase and so on.	dry area, so saving water is a must. Average rainfall is 200-300ml in this area, which requires irrigation.
UBO	UBO is an academic body and it is interested in the scientific and academic exploitation of the SWAMP results. UBO's members will benefit the technical competences gained during the project, fostering the use of IoT in other contexts. In the irrigation domain, UBO will further investigate the potential of IoT and data analytics to boost precise irrigation techniques, water management practices and water saving solutions. In addition, UBO will disseminate the results of the project by taking part to scientific international meetings and by publishing in international journals.	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. UBO 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 EMBR in the sensor manufacturing. UBO can create a new company, a spin-off, and CBEC might do that for optimization of irrigation scheduling.
CBEC	CBEC will take advantage of the IoT implementation by hosting the Italian pilot. Being a farmer consortium and the public body responsible for the irrigation, CBEC will test the benefits associated to the implementation of the IoT platform. The renovation of the water distribution network, together with the available IoT platform will provide the CBEC all the tools to pursue water saving solutions. The CBEC will have the possibility to further develop the platform expanding its application to other fields and to other irrigation districts.	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 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. 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.
QUAT	As a drone manufacturer, Quaternium will mainly exploit the results of the SWAMP project by commercializing the UAS developed and validated during the project, not only in the market of precision farming but also in the security, environment protection and industrial inspection markets worldwide, using its global sales network. After negotiating the exploitation terms,	Quaternium current cannot be precise regarding exploitation of SWAMP results. 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 our business plan, Quaternium is highly interested in studying this potential

	<p>Quaternium will also commercialize the applications developed by the consortium, as a complement to its UAS.</p> <p>As a side form of exploitation, the company will also train end-users and drone service providers in the operation and maintenance of the UAS for smart water management purposes.</p>	<p>market. However, an open and affordable drone might complicate commercialization. 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. Rather than cost, they must think about added value; once you get closer to the market, things get more expensive. Quaternium is partnering with intermediaries that can take more risks and have access to big companies</p> <p>In terms of the drone functionality, it is very likely that Quaternium adopts SWAMP results.</p>
ABC	<p>UFABC has a strong involvement in exploitation of results based on technology transfer and interaction with industries mainly of the ABC region (the most industrialized in Brazil). UFABC recently started an innovative initiative funded by the CNPq called Industrial PhD Program, which aims at promoting interaction between university and industries by means of inserting PhD students into companies, where their research project must fulfil the requirements of both academia and industry. Also, UFABC has a very active Innovation Agency, which aims at integrating the university in the industrial scenario by means of different actions. In the SWAMP project, whenever possible UFABC will try to transfer technology to industry, preferentially to the industrial partners of the project but also to other industries depending on the particular interests of each one.</p>	<p>Being a university, it is more likely that UFABC will use SWAMP results in further research activities. The SWAMP Platform based on FIWARE may be used in a variety of different projects. UFABC FIWARE Lab Node: project proposal submitted to the Brazilian FINEP funding agency</p> <p>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</p> <p>Collaboration: new EU-BR projects or bilateral collaboration with SWAMP partners</p>
FEI	<p>FEI is a non-profit organization funded more than 75 years ago to work with the Brazilian industrial companies to develop technology and prepare students to work in such companies. FEI is interested in the scientific and academic exploitation of the results, as well as improve IoT research activities from Laboratory of Innovation in IoT in other domains. FEI will publish the results of the research in the scientific and industrial communities, and work with FEI Innovation Agency to transfer technology for Brazilian companies, as well as to work in new projects to improve the results from SWAMP.</p>	<p>FEI will focus of exploitation in water management. Right now there is a PhD student at FEI working with "açai" (a Brazilian fruit). Previously açai was obtained by extractivism, but since two years 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.</p> <p>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</p> <p>Industry 4.0 is a new avenue for exploitation of SWAMP IoT-based results in a different area</p>

UPFE	<p>UFPE has a long history of collaboration with all elements of the organized society, at all structural levels. Particularly, the Center of Informatics (CIn) of the UFPE is well-recognized by its involvement with industrial partners and government bodies. In the scope of SWAMP, CIn/UFPE will search collaboration with local companies and governments in order to give further support for deployment of such advanced IoT services in our local context (i.e., the State of Pernambuco). Particularly, as the State of Pernambuco has a number of small to medium sized wineries in the neighbourhood of the San Francisco river, UFPE might be able to contact them for further demonstration of the results of SWAMP.</p>	<p>Key exploitation type for UFPE is creating 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).</p> <p>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.</p>
LEV	<p>LeverTech is a company dedicated to the integration of different Technologies that are offered to the Market through a group of reseller and datacentre companies. Together with these companies it was launched recently a secure cloud communications service called Jaguar Defence, which its main objective is to provide secure and simple connectivity for companies and individuals to the Cloud and IoT. LeverTech expects to collaborate by offering its available Technologies and expertise, and to benefit from the results of the SWAMP Project, especially generating new important offers to the Market.</p>	<p>Exploitation objective for LeverTech is to take the SWAMP solution to the market. The path is by the existing distribution channels, i.e., companies that sell irrigation products and services. 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.</p> <p>The focus must be 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 buyers it means that the product is desired by the market. A success for the market is one can sell their products.</p> <p>Exploitation of SWAMP results: most farmers around Brasilia (where LeverTech is located) have two problems: 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</p>
EMBR	<p>Brazilian Agricultural Research Corporation (Embrapa) is a technological innovation enterprise focused on generating knowledge and technology for agriculture. It is focused on the challenge of developing a model for tropical agriculture and livestock aiming a sustainable production. Thus, Embrapa is interested in the development and analysis of the</p>	<p>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 VRI solution, an</p>

	<p>technologies produced in SWAMP scope for a sustainable production as well as in their general impact on tropical agriculture. Embrapa Instrumentation (an Embrapa thematic center) has know-how in Precision Agriculture, Remote Sensing, Automation, Sensors/Actuators and Precision Irrigation for food production in different biomes and cultivation systems. SWAMP will contribute to expand knowledge and technology for several different cultures in tropical agriculture and for defining a common-use platform for irrigation systems.</p>	<p>agreement that is about to be signed, which is one way EMBRAPA considers the results of SWAMP to be exploited. A mind map of SWAMP exploitation is used for visually organizing information, the EMBRAPA mind map shows SWAMP results supported by high tech start-ups 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 start-ups. Fockink is an example of a high tech company that may explore SWAMP results. Embrapa is also interested in reusing technologies and concepts explored in SWAMP in other farming challenges involving different crops, planting systems, areas and even fish farming. The reuse of IoT technologies can accelerate the development of the sector. Partnerships with startups in this sense can also be explored.</p>
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6. SWAMP Interest Group

Within the first year of the project, SWAMP has been attracting the attention of different stakeholders of the irrigation business and end-users. This is particularly true in Brazil where agriculture plays a key role in the economy, both for internal food security and for export. Farmers approach SWAMP partners because they want to host another pilot, as well as companies, which want either to have their names associated to an important project or they want to have access to news regarding project results, findings and exploitation opportunities in first hand. Also, the SWAMP Internal Workshop on Innovation and Exploitation detected the need for SWAMP partners to get closer to potential end-users and stakeholders to increase the odds of successful exploitation of project results.

Considering that it is not feasible to add new project partners and new pilots to the project, but to keep an open channel with potential future stakeholders the SWAMP project will create the SWAMP Interest Group (SWAMP-IG). Project partners will develop different ways of effective communication with the SWAMP-IG members such as mailing lists and special events such as webinars. Also, a survey will be conducted about their key goals and interests so as to provide a customized and meaningful communication with them. As a starting point, there will not no predetermined limit of members in the SWAMP-IG and they will be selected based on similarity of interests by two approaches:

- 1) Passive SWAMP-IG member selection: whenever SWAMP partners are approached by interested end-users and stakeholder, they can offer them membership in the group;
- 2) Active SWAMP-IG member selection: SWAMP partners may go after interesting members for the group, with heterogeneous and complementary profiles, activity area and core business.

The creation of the SWAMP-IG will start as soon it is formally approved by the Project Steering Group.

7. Final Remarks

The Exploitation Plan shows an evolution of partner’s perspectives on SWAMP innovation, which was more generic in the initial exploitation plan and now starts to be more specific and focused. An important fact

that influenced the Exploitation Plan was the SWAMP Internal Workshop on Innovation and Exploitation, where partners presented their current perspectives about this important subject.

Another important outcome of the workshop was that in the end partners agreed that a final workshop on innovation and exploitation will be conducted, so that we can exchange our more informed views with each other and document it accordingly.

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. The final perspective of SWAMP partners will be reported in D6.5 Exploitation activity report due to the end of the project (month 36).

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