



D5.3 ECOSYSTEM BUILDING STRATEGY

WP 5

April 28, 2017



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1. INTRODUCTION

The IoF2020 project accelerates the uptake of Internet of Things (IoT) technologies in the European farming and food chains in view of strengthening their competitiveness and sustainability.

To achieve this, IoF2020 work is structured around five Work Packages (WPs):

- WP1, which is responsible for the successful management and coordination of the project;
- WP2, dedicated to the management of the five trials running within IoF2020;
- WP3, which guides use cases on how to leverage existing IoT technologies, approaches, methodologies and guidelines, and facilitates collaboration between use cases;
- WP4, which provides business support to the developed solutions;
- WP5 on ecosystem development.

This document has been developed within WP5. **It aims to develop a strategy on building a sustainable ecosystem for the long-term application and societal appreciation of IoT technologies, by demonstrating the possibilities and advantages of the innovations developed in the five trials of IoF2020.**

This document should be regarded as a living instrument, to be updated during the entire duration of the project.

The document is structured as follows:

Following an introduction and presentation of the document's structure in **Chapter 1**, **Chapter 2** provides an overview of the sector (i.e. precision agriculture) followed by the introduction to the IoF2020 project. Building on the presentation of the sector and the project in general terms, **Chapter 3** outlines the strategy for the IoF2020 ecosystem building. As a core of the document, Chapter 3 is divided in seven subchapters. First, Chapter 3 presents overall goals and background to the ecosystem building approach. This is followed by the detailed description of the IoF2020 ecosystem. Second, Chapter 3 determines target groups and unique selling points of the IoF2020 ecosystem. Third, this is followed by the presentation of stakeholder and SWOT analysis outlining key stakeholders in the sector as well as main weaknesses, strengths, opportunities and threats. In the end of the chapter, a detailed road map on how the IoF2020 ecosystem will be built is provided. This includes presentation of different layers of the IoF2020 ecosystem (i.e. geographical levels as well as trials and use cases levels), distinct phases of the IoF2020 ecosystem building process and key performance indicators measuring impact of the IoF2020 ecosystem. Following the strategy towards the building of IoF2020 ecosystem, a detailed communication strategy is presented in the **Annexes (Chapter 4)**. This includes presentation of communication goals and activities in accordance with the distinct phases of the project realisation.

2. INTERNET OF FOOD AND FARM

One of today's biggest trends in farming is Precision Agriculture (PA), which enables farmers to harness the Internet of Things (IoT) and connect farm equipment to geo-location data, thus enabling farmers to coordinate and optimise farm production in innovative ways.

IoF2020 will create a favourable environment for the appreciation in the society of IoT technologies and their application to the agri-food sector thereby extending the PA concept to Smart Farming, in which a farm becomes a smart web of interoperable farm objects.

This chapter provides further information about the trend of Precision Agriculture (2.1.) and about the IoF2020 project (2.2.). By building an ecosystem, IoF2020 aims to involve different communities and help them interact. This will facilitate the adoption of IoT and PA by the majority of farmers rather than only by a community of 'pioneers' and early adopters.

2.1. ABOUT PRECISION AGRICULTURE

Precision agriculture or precision farming, is a farming management concept using information management techniques to monitor and optimise agricultural production processes. Rather than applying the same amount of fertilisers over an entire agricultural field, or feeding a large animal population with equal amounts of feed, PA will measure variations in conditions within a field and adapt its fertilising or harvesting strategy accordingly. Likewise, it will assess the needs and conditions of individual animals in larger herds and optimise feeding on a per-animal basis. Utilising PA can therefore result in a production efficiency and a smaller environmental impact than traditional, less precise farming techniques.

Key technologies in precision farming include, among others:

- **Decision support tools** such as specialised computer software, which can support farmers when making important decisions.
- **Robotics** like automatic milking machines, which can greatly improve the production efficiency of a farm.
- **High precision positioning systems (like GPS)** are the key technology to achieving accuracy when driving in the field, providing navigation and positioning capability anywhere on the Earth, anytime under any conditions.
- **Automated steering systems** enable taking over specific driving tasks like auto-steering, overhead turning, following field edges and overlapping of rows. These technologies reduce human error and are key to effective site management.
- **Geomapping** is used to produce maps including soil type, nutrients levels etc. in layers and assign that information to the field location.
- **Sensors and remote sensing** is used to collect data from a distance to evaluate soil and crop health (e.g. moisture, nutrients, compaction, crop diseases). Data sensors can be mounted on the moving machines.
- **Integrated electronic communications** between components in a system for example, between a tractor and a farm office, the tractor and a dealer or a spray can and a sprayer. This technology can be used to better track food quality and safety through the supply chain.
- **Variable rate technology (VRT)** can adapt parameters on the machine to apply, for instance, seed or fertiliser per the exact variation(s) in plant growth, or soil nutrients and type.

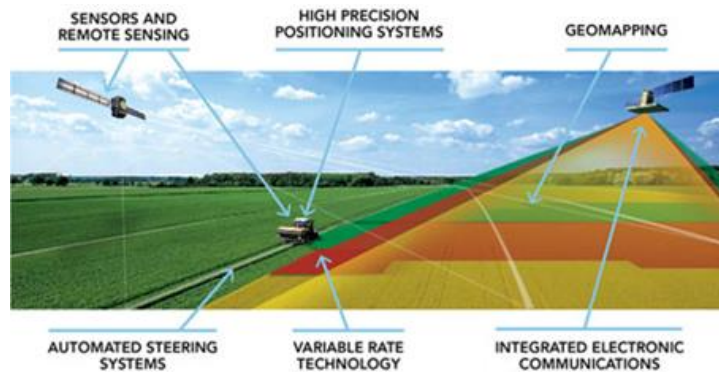


Figure 1: Illustration of some key technologies in precision agriculture

Source: <http://www.cema-agri.org/page/precision-farming-key-technologies-concepts>, retrieved on 27 April 2017.

2.2. ABOUT IOF2020

The Internet of Things (IoT) is a powerful driver that will transform the food and farming sector into a smart web of connected and context-sensitive objects. These objects can be easily identified, sensed and controlled remotely. As such, they will drastically improve productivity and sustainability of the sector.

Although IoT technologies are already available at European level and attract world-wide interest, challenges for their implementation in the food and farming sector remain. These challenges include the lack of broadband Internet connectivity in remote rural areas and specific nature of the objects in the food and farming sector, e.g. the fact that these are living creatures, who themselves cannot be connected. A challenge is also represented by the new skills to be acquired by farmers. These skills can be divided into three categories: ICT and automation/robotics technologies (e.g. work with robots, advanced machinery), environmental (e.g. understanding legislation, knowledge of local ecosystems) and managerial (e.g. business and innovation management, marketing skills). Next to these sector-specific challenges, a large-scale uptake of IoT technologies in the food and farming sector is faced with general concerns related to the future technological advancement. These include lack of interoperability, data ownership along with data privacy and security issues, as well as the lack of appropriate business models, suiting well small and medium size enterprises (SMEs). Ultimately, the issues described above lead to a fragmented application of IoT in the food and farming sector, mainly by a small population of early entrepreneurs.

The Internet of Food and Farm 2020 (IoF2020) project addresses both organisational and technological challenges aimed at overcoming the current situation. Its main objective is to foster a large-scale uptake of IoT in the European food and farming sector. This overall aim feeds in four specific objectives:

1. To demonstrate the business case of IoT for a large number of application areas in the food and farming sector.
2. To integrate and reuse available IoT technologies by exploiting open infrastructures and standards.
3. To ensure user acceptability of IoT solutions in the food and farming sector by addressing user needs.
4. To ensure the sustainability of IoT solutions beyond the IoF2020 project by validating the related business models and setting up an IoT ecosystem for the large-scale uptake.

To achieve its general, but also specific objectives, the IoF2020 project brings together 71 partners, working on 5 trials, covering the areas of arable farming, dairy, fruits, vegetables and meat. These trials

are divided in 19 vertical and horizontal use cases, aimed at showcasing the application of IoT in the European food and farming sector.

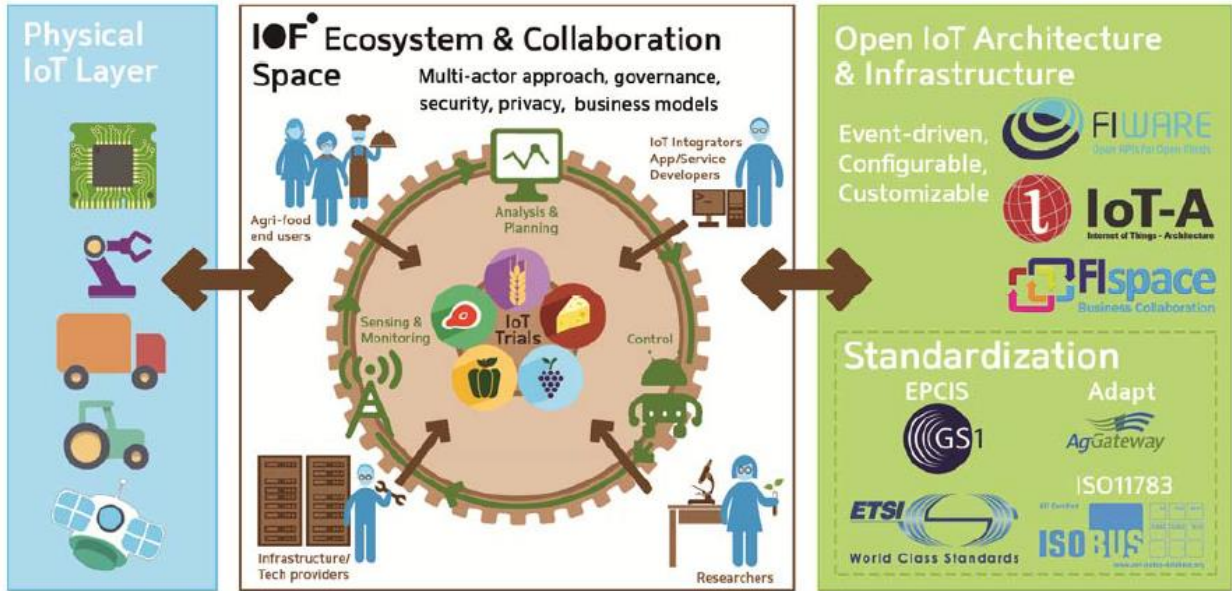


Figure 2: Overall concept of IoF2020

3. ECOSYSTEM BUILDING STRATEGY

3.1. GOALS

The goal of the ecosystem building strategy is to connect all different communities and actors from the agri-food and IoT domains to work together on developing new solutions for more sustainable and competitive agriculture in Europe.

More specifically, this ecosystem building strategy focuses on providing the ground for:

1. Enhancing **development and the market uptake** of IoT technologies in the agri-food sector;
2. Developing and improving **acceptability** of the IoT technologies among **the end-users**;
3. Facilitating **interoperability** of the IoT technologies developed in the IoF2020 project.

3.2. BACKGROUND TO ECOSYSTEM APPROACH

What is an ecosystem?

The concept of ecosystem has been brought to business context by James F. Moore from the biological studies, where a natural life ecosystem is defined as a biological community of interacting organisms plus their physical environment with which they also interact. By analogy with natural life ecosystem, Moore has defined *a business ecosystem as the “Network of buyers, suppliers and makers of related products or services”, plus their socio-economic environment, including the institutional and regulatory framework*. Interacting organisations and individuals represent the “organisms of the business world” and form the foundation of the economic community delivering goods and services to customers – as well as the members of the business ecosystem.

Similarly to the organisms in the biological ecosystem, **the actors in the business ecosystem co-evolve their capabilities around specific innovation(s) by both competing and cooperating with each other**.

Business ecosystems are formed around a specific *core*, i.e. a set of assets shared and commonly utilised by the actors forming the ecosystem. Making these assets available to the ecosystem members helps them in product and service creation by enabling higher levels of productivity, stability and innovativeness, while also creating the positive network effect.¹

In IoF2020 this core is represented by the IoT. Since the essence of the IoT is the interconnection of the physical world of things with the virtual world of Internet, the software and hardware platforms as well as the standards commonly used for enabling such interconnection are the core of the IoF2020 ecosystem.

In IoF2020, such as core brings together two communities: the IoT community and the agri-food community both cooperating utilising the common set of core assets related to the interconnection of the physical world of things with the virtual world of Internet and its application to the agri-food domain.

¹ Andreev, Sergey, Balandin, Sergey, Koucheryavy, Yevgeni, *Internet of Things, Smart Spaces, and Next Generation Networking*, 12th International Conference, NEW2AN 2012, and 5th Conference, ruSMART 2012, St. Petersburg, Russia, August 27-29, 2012, Proceedings, pp. 3-5.

What is the nature of IoF2020 ecosystem?

In its essence, the IoF2020 ecosystem is **open** for all relevant stakeholders with an interest in the issue. Its openness is based on four pillars:

1. In order to achieve a **global impact**, the IoF2020 ecosystem will remain open and invest in engaging new stakeholders from all over the world. This encompasses engagement activities at **international, European, national, regional and local level**. This will be further reinforced with the publication of the open call for new partners.
2. The expansion of the IoF2020 ecosystem will be based on the **bottom-up approach**, as the IoF2020 ecosystem will induce its stakeholders to **self-organise** by developing their own innovative technologies that will have to be integrated in the already existing pool of the IoF2020 empowered solutions.
3. Special attention will be given to establishing relations with those stakeholders, who were initially established as the **private-public partnerships (PPPs)** to: (1) make the bridge between public and private sector and (2) learn from the past experiences by building upon them in order to develop a strong and sustainable ecosystem.
4. Next to the industrial actors and public sector, the end-users will be induced to partake in the IoF2020 ecosystem through the concept of **co-creation**. As co-creators, they will be invited to **share** their **knowledge** and expertise, while at the same time commenting on the end-products and thereby making them better.

The IoF2020 ecosystem should not be regarded as an isolated system. On the contrary, the IoF2020 ecosystem should be built on the already existing legal frameworks and structures, such as the **Digital Single Market (DSM)** and the **Common Agriculture Policy (CAP)**. By bridging these distinct policy areas, the IoF2020 ecosystem will bring an **added value** to the existing market, while at the same time advocating regulators and policy-makers to provide ground for further **investment** and **innovation** in the food and farming sector. Only with sufficient support from the regulators and policy makers can the IoF2020 ecosystem strive for the **scientific excellence** in the large-scale uptake of IoT technologies in the food and farming sector. This includes development of new technologies, that will make the IoF2020 ecosystem an **innovation platform** for the years to come.

The IoF2020 ecosystem will measure its success through its **visibility** among the end-users. In brief, the IoF2020 visibility will be measured by the number of stakeholders included, but also by the number of new technologies developed and presented to the end-users. However, these technologies should not be developed for the sake of developing technologies. On the contrary, they should help the IoF2020 ecosystem develop further an **innovative approach to the value-chain**, thereby making it a true **trailblazer** in the food and farming sector. This innovative approach includes a special focus on the **regional and local levels**, as the ones closest to the end-users in the supply chain (from farm to fork), who are at the heart of the IoF2020 ecosystem. By applying this down-to-earth principle, the IoF2020 ecosystem will enhance **entrepreneurial spirit** among the general population, but also contribute to the **creation of new jobs** and **matchmaking of the new skills**.

As innovative platform, consisting of different stakeholders and collaborating closely with the end-users, the IoF2020 ecosystem is faced with robust challenges. These include:

1. **Compliance** issues among all its stakeholders (i.e. data privacy and storage).
2. **Resilience** towards new markets (i.e. market niches), customers and services.
3. **Language** issues.
4. **Interoperability** among different technologies, including the interoperability between the human factor and developed technologies.
5. **Transformation** issue (e.g. how to successfully transform the IoF2020 ecosystem from a scientific into a business community).

To address all these challenges, the IoF2020 ecosystem will:

1. Set transparent **key performance indicators (KPIs)**.
2. Upon setting the KPIs, the IoF2020 ecosystem will be built by focusing on the **interoperability** and **sustainability** of technological solutions developed by its stakeholders.



All these activities should help the IoF2020 ecosystem to become self-sustainable once public funding is over and especially to induce its stakeholders involved in the use cases to develop **new business models**, based on the co-creation and inclusion of the end-users. This innovative approach will bring an added value to the already existing value chain.

An ecosystem with a multi-actor approach at its heart

The multi-actor approach is an innovative concept which was introduced for Horizon 2020 supported agriculture and forestry projects in 2014 for the first time. **The multi-actor approach aims at more demand-driven innovation through the genuine and sufficient involvement of various actors** (the end-users such as farmers/farmer groups, fishers/fisher groups, advisors, enterprises, etc.) **all along the projects**: from participation in the work planning and experiments, via project execution to dissemination of the final results.

The IoF2020 will integrate the multi-actor approach in all its dissemination and communication activities by:

- Involving all relevant stakeholders in its ecosystem;
- Compiling knowledge “ready for practice” and transposing it in an easily understandable language used by the target groups on most of the communication and dissemination channels;
- Aiming at greater end-user acceptance and dissemination of the materials targeted to the end-users;
- Ensuring the results will be available in the long term.

3.3. IOF2020 ECOSYSTEM

IoF2020 ecosystem is composed of stakeholders across different communities. By bringing these different communities together, IoF2020 will pave the way for a symbiotic ecosystem of stakeholders working together to promote the sustainability and competitiveness of the agri-food sector in Europe.

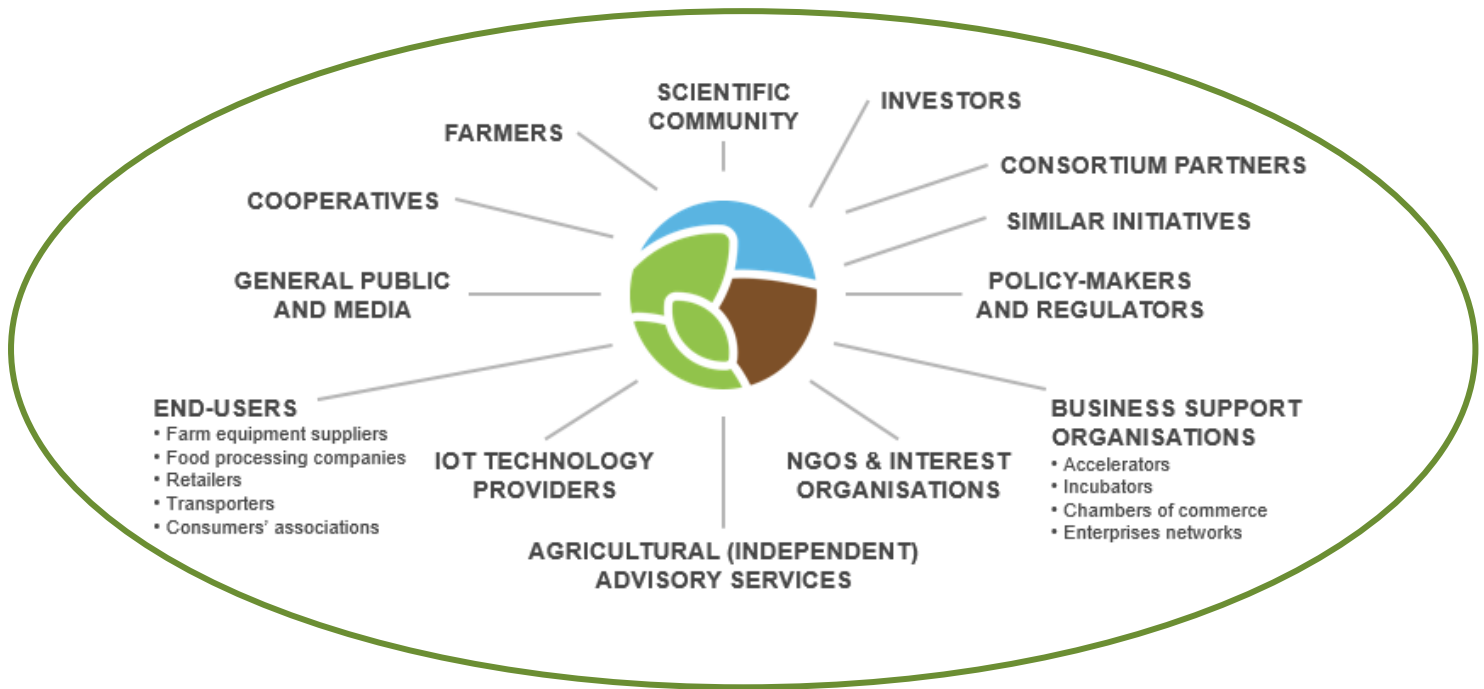


Figure 3: The IoF2020 ecosystem

The IoF2020 ecosystem is built around different target groups. They will be outlined in the following section.

3.4. TARGET GROUPS

The table below presents the IoF2020 target groups:

Target group	Definition	Who are they?
Consortium participants	<i>The IoF2020 partners.</i>	<ul style="list-style-type: none"> • 71 partners • Trial leaders • Use cases
Similar initiatives	<i>Other networks, projects and initiatives with whom relations have already been established or will be established.</i>	<ul style="list-style-type: none"> • Large Scale Pilots (LSPs) • AIOTI Alliance and WG06 on Smart Farming • European Innovation Partnership on Smart Agriculture – EIP AGRI • FIWARE

		<ul style="list-style-type: none"> • The Club of Ossiach • Other H2020 projects (e.g. Smart-AKIS) • Other nationally funded projects
Farmers & Cooperatives	<p><i>Farmer(s): a person who operates a farm or cultivates land.</i></p> <p><i>Cooperative(s): organisation of farmers for marketing products/ buying supplies/sharing services or assets</i></p>	<ul style="list-style-type: none"> • Farmers • Cooperatives
End-users	<p><i>Stakeholders, directly using produced services and/or benefiting from the project outcomes.</i></p> <p><i>IoF2020 includes end-users for the entire supply chain, from farm to the plate.</i></p>	<ul style="list-style-type: none"> • Farm equipment suppliers • Food processing companies • Transporters • Retailers • Consumer associations
IoT technology providers	<p><i>Companies or other entities developing, producing and selling the IoT technologies.</i></p>	<ul style="list-style-type: none"> • Corporations • SMEs
Agricultural (independent) advisory services	<p><i>Services assisting and making new knowledge available to the farmers with the aim of further developing their farming and management skills.</i></p>	<ul style="list-style-type: none"> • Agricultural (independent) advisory services • Innovation brokers
Business support organisations	<p><i>Entities supporting the establishment of a business entity.</i></p>	<ul style="list-style-type: none"> • Accelerators • Incubators • Network of enterprises • Chambers of commerce
Interest organisations / NGOs	<p><i>Interest organisations are the entities representing interests of a particular sector.</i></p> <p><i>NGOs are non-profit organisations, operating independently of government.</i></p>	<ul style="list-style-type: none"> • Interest organisations • NGOs
Investors	<p><i>Business entities committing capital for a financial return.</i></p>	<ul style="list-style-type: none"> • Banks • Investment funds

Scientific community	<i>A diverse network of interacting scientists.</i>	<ul style="list-style-type: none"> • Research centres • Universities
Policy makers and regulators	<i>Individuals responsible for determining and applying policies and legislations.</i>	<ul style="list-style-type: none"> • Members of the EU institutions (European Commission DG AGRI & DG CONNECT, MEPs, etc.) • Members of the national governments • Members of the regional and local governments
General public & media	<p><i>General public is a community of people bonded by their general welfare interests, regardless of their other interests and/or occupations.</i></p> <p><i>Media are the communication channels through which the IoF2020 key messages can be disseminated.</i></p>	<ul style="list-style-type: none"> • General public • Radio • Television • Newspapers • Magazines • Individuals interested in IoF2020

3.5. UNIQUE SELLING POINTS

Unique selling points (USPs) have been identified for each of the aforementioned target groups.

The unique selling points cover two levels:

1. The IoF2020 project;
2. The importance of the IoT technologies for the agri-food sector.

They are presented in the table here below:

Target group	USPs
Consortium participants	<ul style="list-style-type: none"> • Thanks to its communication channels, IoF2020 will keep consortium participants constantly informed about any developments. • Contribution and participation of the consortium partners in communication activities is key to the success of the project!
Similar initiatives	<ul style="list-style-type: none"> • IoF2020 will provide timely information about the intermediate and final results of the project. The same applies to the open call. • IoF2020 is a unique platform for sharing knowledge and facilitating the market uptake of the IoT technologies within Europe's agricultural sector.
Farmers & Cooperatives	<ul style="list-style-type: none"> • IoF2020 represents the beginning of the 21st century farming in Europe.

	<ul style="list-style-type: none"> • IoF2020 is developing cutting edge agricultural products and services by using the IoT technologies that lower costs of the agricultural production, improve sustainability and bring benefits to the farmers. • IoF2020 will empower the farmers and cooperatives with a new business model enabling them to generate business out of aggregated data. • IoF2020 is active in several sectors (i.e. arable farming, dairy, fruits, vegetables and meat), covering a variety of agricultural conditions and crops.
End-users	<ul style="list-style-type: none"> • IoF2020 brings solutions from farm to the plate in five sectors (i.e. arable farming, dairy, fruits, vegetables and meat). • The IoF2020 ecosystem is built to develop further an innovative approach to the agri-food value-chain. In brief, it is a true trailblazer in the food and farming sector.
IoT technology providers	<ul style="list-style-type: none"> • IoF2020 is a unique project. It develops the IoT technologies together with the end-users, while driving development and integrating different products/services, meeting the needs of end-users and their business processes. And all of this in collaboration with the key stakeholders! • Agriculture is an enormous, yet underexploited market opportunity for IoT technology providers.
Agricultural (independent) advisory services	<ul style="list-style-type: none"> • IoF2020 will provide innovative services to the farmers. This will bring your communication with the farmers on a new level as you will be able to propose solutions which simplify farmers' job, save them time and reduce red tape. • Your support in explaining these innovations is crucial for the large-scale uptake of these innovative services.
Business support organisations	<ul style="list-style-type: none"> • The IoF2020 project demonstrates success stories related to the application of IoT products/services in the agricultural sector. • These products/services are widely accepted by the pilot communities and end-users, who recognised the potential these technologies have to improve returns from the agricultural production. • The IoF2020 technologies offer vast market opportunities.
Interest organisations / NGOs	<ul style="list-style-type: none"> • The IoF2020 technologies, applying cutting-edge IoT technologies in agriculture, bring benefits rippling through several segments: environment, food quality, rural development, innovation and research, etc.
Investors	<ul style="list-style-type: none"> • IoF2020 supports a large-scale uptake of innovative IoT technologies in agriculture, while co-developing them with the end-users. This process guarantees these technologies are fit for the market, while enhancing their investment potentials. • The IoF2020 technologies have already attracted a large interest among the agricultural community. Although still in infancy, the IoF2020 project is a gateway to this new, promising sector.

Scientific community	<ul style="list-style-type: none"> • IoF2020 is collecting a large amount of data and information about a variety of farming activities across Europe. These include arable and dairy farming, as well as a fruit, vegetable and meat production. • Certain data and information collected during the IoF2020 project will be available to researchers through the IoF2020 website (www.iof2020.eu). The researchers are welcomed to seek additional information, feeding their research endeavours, from the IoF2020 WP5 leader.
Policy makers and regulators	<ul style="list-style-type: none"> • IoF2020 develops new, cutting edge technologies for the application in the agri-food sector. Thereby, it is important to ensure that development of these products complies with regulations. This includes policy co-development at the same pace with the aim of harnessing the full potential of IoTs. • IoF2020 will provide you information on the results of the project and on the future perspectives opened by the innovations developed.
General public & media	<ul style="list-style-type: none"> • IoF2020 is a landmark project, conducted across Europe, to develop and demonstrate application of the innovative IoT technologies in the agricultural sector. • This is the beginning of the next technological revolution, affecting the European farming and bringing multiple benefits for the farmers, environment, rural and urban communities, and food safety while improving the European smart economy.

3.6. STAKEHOLDER AND SWOT ANALYSIS

3.6.1. Stakeholder analysis

The stakeholder analysis aims to identify the most relevant stakeholders for building of the IoF2020 ecosystem.

At the beginning of the project, mapping of relevant IoF2020 stakeholders was conducted. A total of **963** stakeholders from **33** countries were identified. An outline of the countries covered is provided in the figures below.

The stakeholder analysis is an on-going process. As such, it will continue throughout the entire duration of the project. The contacts gathered will be used to build the IoF2020 ecosystem and for IoF2020 communication and dissemination activities.

N. of stakeholders per country

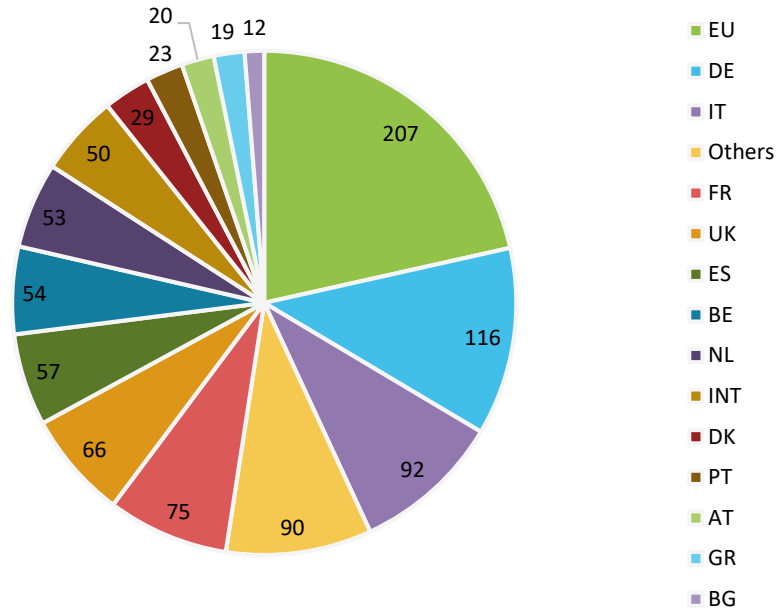


Figure 4: Number of stakeholders per country

All target groups were covered in the analysis. The number of stakeholders per target group is presented in the table below.

N. of stakeholders per target group

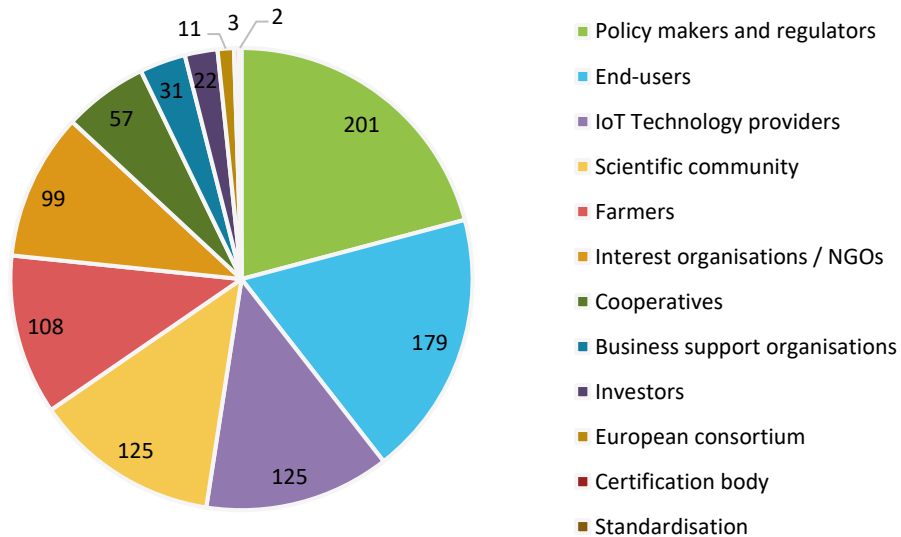


Figure 5: Number of stakeholders per target group

3.6.2.SWOT analysis

The aim of the SWOT analysis is to provide an overview of the Strengths, Weaknesses, Opportunities and Threats faced by the IoF2020 project in relation to the ecosystem building.

1. Methodology and definitions

Strengths and **Weaknesses** are internal factors within the IoF2020 project, while **Opportunities** and **Threats** are external factors, e.g. factors in society that could potentially support or may have a negative impact on the IoF2020 project and the likelihood to achieve its goals and objectives.

The factors have been identified through an initial desk research and the results from the stakeholder analysis.

2. Strengths

- a) The **initial ecosystem** is the ecosystem identified in the initial stage of the project. Its strengths are:
 - The **database of stakeholders covering all identified target groups**. It ranges from the end-users and IoT technology providers to the policy-makers
 - The **geographical scope of the database is broad**. Identified stakeholders represent 33 countries, covering International, European and national levels.
- b) The IoF2020 project is the **largest scale-pilot project (LSP)** bridging the farming sector and the IoT technologies in Europe.
- c) On one hand, the IoT technologies are often regarded as a novel concept for the general public and are expected to provide advanced technologies. On the other hand, the farming sector is a traditional sector. The combination of both sectors is opening a **wide range of possibilities and interested stakeholders, thereby extending initial outreach**.
- d) As mentioned above, IoF2020 is a unique large-scale project bridging the IoT technologies and the agri-food sector. Therefore, it is also a unique opportunity for the consortium partners to **share their cross-cutting knowledge**.
- e) A **well-structured and pre-defined ecosystem building strategy** provides a solid foundation for increasing the IoF2020 project visibility and outreach towards other stakeholders.

3. Weaknesses

- f) As stated above, the IoT technologies are often regarded as a new concept for the general public and farmers. The implications of **the use of IoT technologies in the farming sector are not clearly understood** by these two target groups.
- g) The difficulty to understand what IoT is and how it can benefit the farming sector is a consequence of distinct factors, including:
 - The IoT platforms often **lack interoperability**;
 - The use of IoT in the farming sector assumes that farmers have **e-skills and access to the broadband Internet in rural areas**;
 - The general public can sometimes **lack background knowledge** to adequately understand what the IoT technologies are;
 - Investment in innovative technologies represents a **financial burden** for the end-users. There is currently a **lack of private/public funding schemes** to develop the IoT solutions.
- h) The **composition of the consortium is quite diverse**. It could imply differences of approach in ecosystem building, considering the diverse expectations from the varied types of stakeholders involved (e.g. companies, researchers, farmers, etc).

4. Opportunities

- i) The **IoT technologies are expected to be developed to a great extent** in all sectors (including farming) in the years to come.
- j) The IoT is an emerging market. That is why the development of IoT technologies represents **an economic opportunity**. The expected demand will increase rapidly scaling of **new products and services**.

- k) As stated above, IoT is a novel concept for certain stakeholders. For instance, the policy-makers often lack practical insights, while the end-users such as the farmers are not yet familiar with the use of these technologies. Therefore, **the IoF2020 project represents a great opportunity to educate the policy-makers and end-users about the practical application of IoT technologies.**
- l) IoF2020 presents a unique **opportunity to shape the perception of stakeholders** without a defined opinion on IoT in the agri-food sector.
- m) In the context of the CAP reform, the topic of smart farming was put on the agenda of the EU policy-makers. That is why the European Parliament organises an increasing number of events on the above-mentioned topic. In brief, the ongoing consultation process on the post-2020 CAP reform creates a **favourable policy-making environment.**
- n) Due to the high expectation surrounding the development of IoT technologies, the **media expresses a certain interest** in the topic.
- o) **Climate change** is an ever-emerging topic on the European political agenda. This is highly relevant for the farming sector as it is the one of the most polluting sector in Europe. The IoT technologies have a strong potential to help farmers reduce CO2 emissions and better manage available natural resources.

5. Threats

- p) Innovators often face various **legislative obstacles**, reducing the valuable time between the moment of inspiration and the real market uptake. On the other hand, a large scale uptake of IoT technologies by the farmers means a **high level of investment** that is not always supported by the policy-makers.
- q) Innovative technologies are often regarded as solutions for the workforce replacements and one of the causes of the high unemployment rates. Therefore, there is a risk that the **opinion of the general public on the IoT technologies remains neutral or turns to negative.**
- r) Due to the lack of a proper education and financial means, **the IoT technologies may not be accessible** to the end-users.
- s) IoF2020 is a large-scale project involving a substantial number of stakeholders. Therefore, there is a challenge of how to **meaningfully involve all target groups in the project.**
- t) The innovative technologies represent a fast-changing market. This is due to the fact that innovative technologies can rapidly become obsolete or overwhelmed by new, more efficient technologies.
- u) For the reasons stated above, the emerging markets are difficult to predict. That is why IoF2020 market penetration might be arduous.
- v) Big data involves the whole supply chain within the IoF2020 project. The **governance, including data ownership, privacy and security will be the key issues to be addressed.**

In conclusion, the SWOT analysis shows that there are several opportunities that can be seized in order to further expand the IoF2020 ecosystem. The same applies for the threats that need to be prevented in order to build a successful ecosystem. The results of the SWOT analysis will be taken into account during the development of the ecosystem. **Of note, the SWOT analysis is a living document, to be updated whenever new risks and opportunities arise or are identified/mitigated.**

Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the IoF2020 project - Summary table

1.Strengths	2.Weaknesses
<ul style="list-style-type: none"> a) Initial ecosystem: <ul style="list-style-type: none"> - Contacts across all target groups - 33 countries covered + the EU and INT levels b) Only EU Large Scale Pilot project for IoT in the agri-food sector c) Many interested stakeholders=large outreach d) Unique opportunity to share cross-cutting knowledge e) Solid strategy for the development of an ecosystem 	<ul style="list-style-type: none"> f) Unclear perception of the IoT technologies by: <ul style="list-style-type: none"> - General public - End-users g) Difficulties in the uptake of IoT technologies: <ul style="list-style-type: none"> - Fragmentation and lack of interoperability - Lack of the farmers' education for the use of IoT - Lack of funding for the purchase of the IoT solutions h) Heterogeneity of the consortium
3.Opportunities	4.Threats
<ul style="list-style-type: none"> i) IoT is the future of farming j) Important economic opportunities: <ul style="list-style-type: none"> - IoT is an emerging market: new products and services produced at a fast pace k) Educating and providing inputs on IoT in the agri-food sector to: <ul style="list-style-type: none"> - Policy-makers - Farmers l) Shaping the perception of stakeholders on IoT in the agri-food sector m) Favourable policy-making environment: <ul style="list-style-type: none"> - The CAP reform, ie. The post-2020 CAP public consultation - Increasing number of events on the topic organised by the EU Institutions n) Increasing interest by the media on the topic; o) IoT in the agri-food sector might be profiled as a solution for the climate change 	<ul style="list-style-type: none"> p) Lack of support from the policy-makers: <ul style="list-style-type: none"> - Unfit legislation - Lack of the financial support q) General public perception of IoT remains neutral or can turn to negative; r) IoT remains inaccessible to the end-users due to: <ul style="list-style-type: none"> - Lack of education - High costs s) Target groups are not meaningfully involved t) Fast-changing market u) Difficult market penetration v) Big Data issues

3.7. HOW DO WE BUILD THE ECOSYSTEM?

IoF2020 will build a sustainable ecosystem for the application and appreciation of IoT technologies in the agri-food sector **by connecting and bringing together different communities:**

- **IoF2020 Consortium.** A community at this level has already been created and will be consolidated by working together on project activities and by exchanging of knowledge and information of the developed technologies and their application;
- **New users of the IoT technologies developed by the IoF2020 trials and use cases.** This community will be created by the publication of an **open call** aimed at involving new users in the use cases, developing additional and more innovative applications, as well as replicating the use cases through new sites or new connected devices, and the complementary assessment of the acceptability of the use cases;
- **Target groups of the IoF2020 projects.** This community will be created through communication, dissemination and public affairs activities which allow the IoF2020 project results to be spread **beyond the project and pave the way for a large-scale expansion.** For this purpose, a detailed communication strategy is outlined in Annex 4.1.

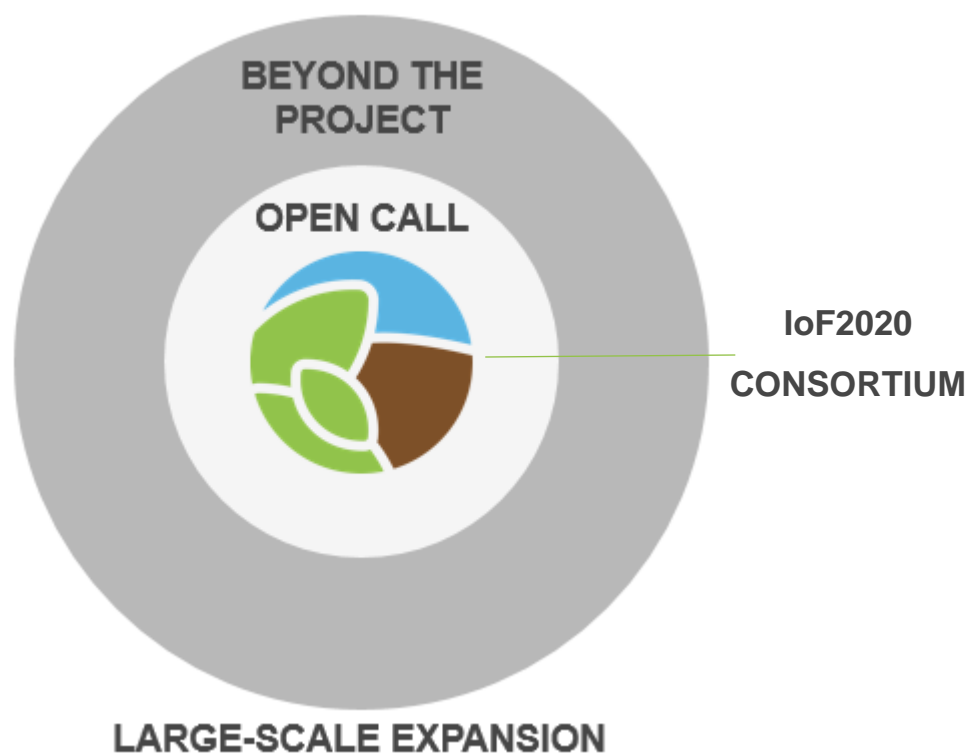


Figure 6: The IoF2020 ecosystem expansion

3.7.1. Ecosystem levels

To maximise its impact, build and expand the ecosystem, IoF2020 will adopt a multi-level approach to remain open for stakeholders at the international, European, national, regional and local level. Considering the European scope of the project, IoF2020 will focus primarily on the European, national, regional and local levels, while also remaining open for the international cooperation.

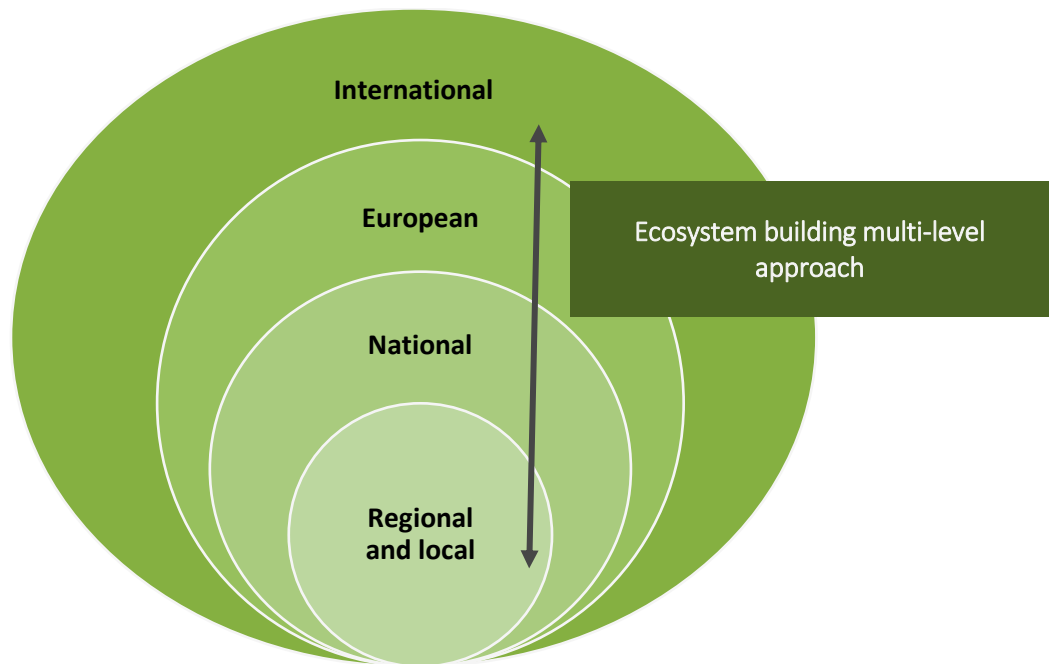


Figure 7: The IoF2020 ecosystem building levels

Regional and local level

Regional and local level is the closest to the IoF2020 target groups, but also to the general public. That is why IoF2020 will aim to include this level in the development of its ecosystem.

The regional and local level can be reached through the:

- **Regional and local activities at the trial and use-case levels;**
- **Business networks of the consortium partners;**
- **Mid-term open call;**
- **Events and fairs taking place at the regional/local level;**
- **Press activities** (i.e. publication of the IoF2020 related articles in local and/or specialised magazines).

National level

The ambition of IoF2020 is to provide solutions and results exploitable in the long run. Therefore, the involvement of the national level is very important to ensure major stakeholders are aware of the project and can uptake the proposed solutions. The primary focus of the activities at the national level will be on the countries from which the IoF2020 consortium partners originate. The ambition is also to expand the IoF2020 ecosystem to other countries by using business networks of the consortium partners and the mid-term open call.

The national level can be reached through the:

- **National activities at trial and the trial and use-case levels;**
- **Business networks of the consortium members;**
- **Mid-term open call;**

- **Use of fairs, networking/matchmaking and similar events**, taking place in the EU Member States;
- **Media database, including relevant national (agri-tech) journalists** from the media outlets located in the EU Member States. As such, the database will be used to expand press activities at the national level (i.e. publication of the IoF2020 related articles in newspapers, magazines and websites), supporting overall outreach to the general public.

European level

Bearing in mind that the IoF2020 consortium partners are mostly based in Europe, it is natural that building of the IoF2020 ecosystem will start by creating a community at this level.

This level can be reached through the:

- **Business networks of the consortium partners;**
- **Mid-term open call;**
- **Close collaboration with FIWARE, EIP-AGRI, AIOTI, the LSP Coordinating Support Actions and other Horizon 2020 relevant projects and similar initiatives;**
- **Media database of relevant European (agri-tech) journalists.** This database will be used to disseminate project activities and outcomes to numerous general and specialised media outlets reporting about the European food and farming sector (e.g. magazines, newspapers etc.)

International level

As the project develops, collaboration will be established with the relevant stakeholders from outside Europe.

IoF2020 has already identified cooperation opportunities with similar projects/initiatives from other countries such as, for instance, New Zealand. Collaborative IoT solutions exist under different layers as illustrated below:

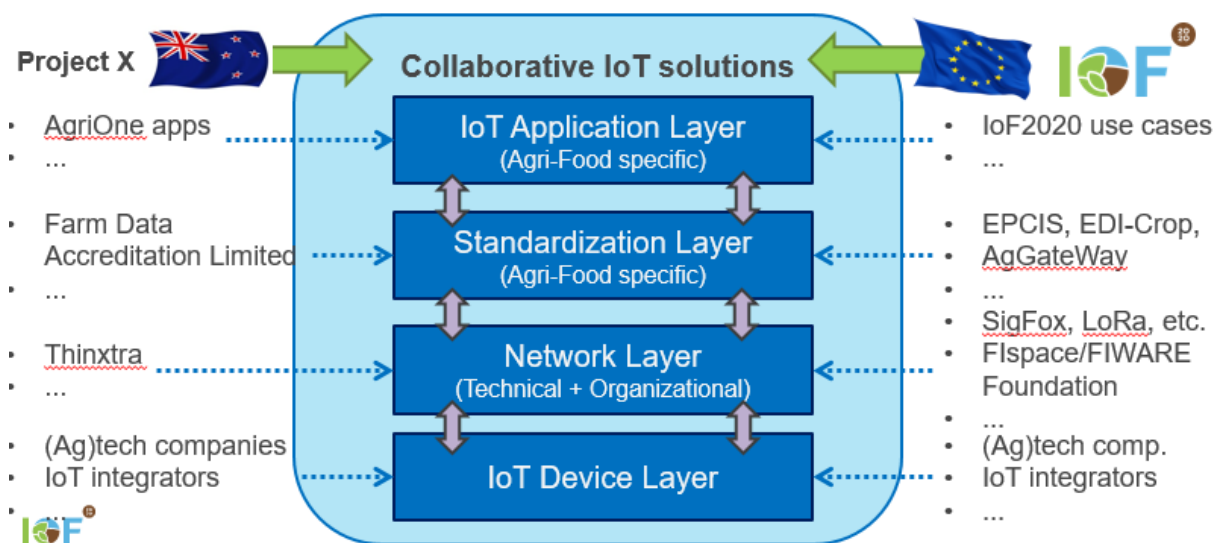


Figure 8: Layers of collaboration opportunities between IoF2020 and New Zealand

Contacts with other transnational stakeholders and other countries outside Europe can be explored during the project lifetime.

The international level can be reached through the:

- **Business networks of the consortium partners;**
- **Use of fairs, networking/matchmaking and similar events,** gathering international participants.
- **Press activities** (i.e. publication of the IoF2020 related articles in international specialised magazines).

3.7.2.Ecosystem trials and use cases levels

Trials and use cases play a pivotal role in the creation of the ecosystem. For this reason, Trial Ecosystem Chairs were nominated within IoF2020.

Trial Ecosystems Chairs' role is to cooperate and liaise with WP5 (Ecosystem Development) providing the needed information to secure that the envisaged objectives established in the final proposal of the IoF2020 project are reached.

Such a liaison will be established through monthly meetings. Such meetings will aim to: 1) Wrap up trials and use cases activities; 2) See how WP5 can, in its capacity, help the WP2 trials and use cases for the promotion and communication of the results of the use cases; 3) Exchange information, experience and knowledge on the activities taking place within the trials and use cases.

3.7.3.Ecosystem building phases

To build an ecosystem, the IoF2020 ecosystem building strategy will follow the different stages of technology readiness. This approach is based on the principle that as technology matures, new value chains will have to be formed and new stakeholders will therefore be engaged.

In brief, the ecosystem building strategy focuses on three phases: 1) sowing; 2) flowering; and 3) harvesting. During these phases the focus will shift from internal (i.e. standardisation of communication materials) to the external communication in order to build a societal ecosystem accepting the IoT technologies. The reason for this steady shift lays in the nature of the European food and farming sector. Namely, the sector is known for its history of heated debates regarding the acceptance of innovative solutions in the European agricultural production.

All three phases together with their respective targets and tools will be further outlined in Annex 4.1.

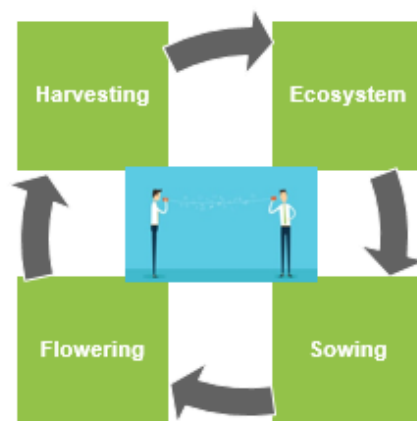


Figure 9: The IoF2020 ecosystem phases

3.7.4.Ecosystem building KPIs

The following KPIs were set in the Grant Agreement for the monitoring of the achieved goals of the ecosystem building strategy.

Obj.	Target outcome	KPIs	Target values
Q4	IoT Ecosystem for large scale take-up	Number of new stakeholders involved (end-users, IoT companies, consultants, R&D organisations, investors, standardisation bodies, policy makers, etc).	500
		Number of new Agri-Food and IoT communities involved	25
		Number of active partners in the LSP	100

4. ANNEXES

4.1. COMMUNICATION STRATEGY

Communication activities will play an important role in the development of the IoF2020 ecosystem. For this reason, a separate IoF2020 communication strategy was developed and will complement the above outlined ecosystem building strategy.

The IoF2020 communications activities will take place at two levels:

1. **Internal IoF2020 communication** will facilitate the flow of information between partners and participants of different trials, use cases and WPs;
2. **External IoF2020 communication** is directed towards different target groups, including the general public.

The content and messages of the IoF2020 internal and external communication are similar and closely linked. As such, they will cross-pollinate each other.

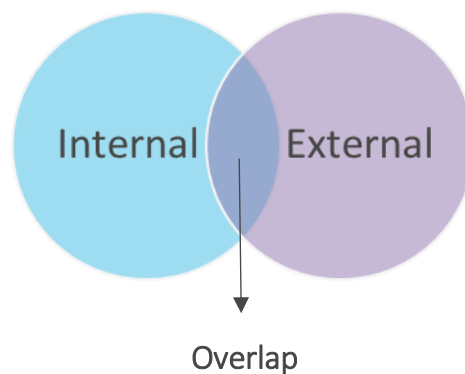


Figure 10: Internal and external communication

4.1.1. Goals

The IoF2020 communication strategy contributes to building the IoF2020 ecosystem as it will help increase the involvement of external target groups and communities.

The goals of the communication strategy are to:

- **Raise awareness** about the project activities, ultimately raising the project visibility;
- **Inform** the target groups and general public about the project outcomes;
- **Promote** and convince the end-users about the added value of the used technologies with the purpose of extending the life-cycle of developed solutions beyond the project. This will help generate more demand for developed products and services;
- **Engage** and facilitate engagement of different stakeholders. This includes establishing connections with other similar projects and initiatives.



Figure 11: The IoF2020 communication strategy goals

4.1.2. Activities

The following activities will be implemented under the IoF2020 communication strategy:

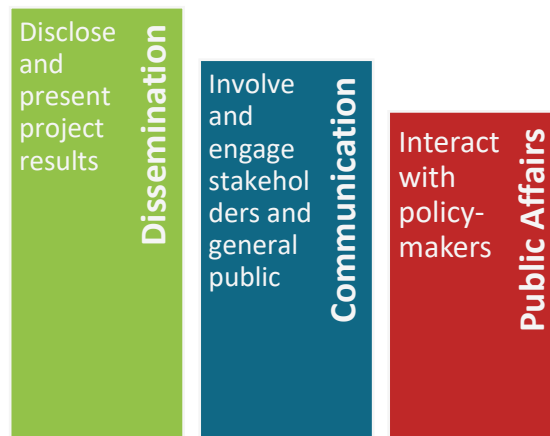


Figure 12: The IoF2020 communication strategy activities

Dissemination

Dissemination is a one-way process. It aims to disclose and present the IoF2020 outcomes to identified target groups and the general public.

Communication

Communication implies an interaction and a multi-directional (rather than unilateral) process. This is achieved through the stakeholder engagement throughout the whole course of the project by sharing information, enhancing dialogue and transparency.

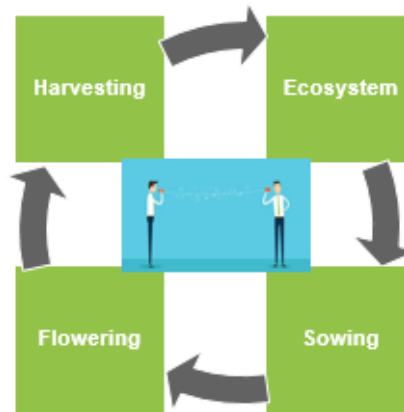
Public Affairs

Public affairs activities are aimed at engaging with the policy makers and regulators by providing facts and assisting them in development of the better policies and legislation for the uptake of IoT in the food and farming sector.

4.1.3. Phases and tools

In this section, the implementation phases of the IoF2020 communication strategy will be presented. These correspond to the ecosystem building strategy phases. Each phase has its own focus, target groups and main tools to be used in its implementation.

The table below presents an overview of all phases of the communication strategy:



Sowing	Flowering	Harvesting
M1-M9	M9-M40	M24-M48
Focus: <ul style="list-style-type: none"> • Raise awareness • Inform 	Focus: <ul style="list-style-type: none"> • Promote • Engage 	Focus: <ul style="list-style-type: none"> • Keep engaged • Sustainability of the IoF2020 ecosystem
Key dissemination channels: <ul style="list-style-type: none"> • Ecosystem building strategy; • Basic communications tools: project identity, formats and briefings, website; • Stakeholder analysis; • Kick-off event. 	Key dissemination channels: <ul style="list-style-type: none"> • Online communications (newsletters, social media); • Regulatory & events monitoring; • Building media relations; • Participation in events; • Side events; • Stakeholder event. 	Key dissemination channels: <ul style="list-style-type: none"> • Policy recommendations (public affairs); • Selection and training of the spokespersons; • Video testimonials; • Scientific publications; • Site visits and workshops for the end-users; • Final event.
Target groups: <ul style="list-style-type: none"> • Consortium partners; • Trial leaders; • Use cases. 	Target groups: <ul style="list-style-type: none"> • Farmers & Cooperatives; • End-users; • Agricultural (independent) advisory services; • IoT technology providers; • Scientific community; • Business support organisations; • Investors; • Interest organisations/NGOs; • Policy makers and regulators. 	Target groups: <ul style="list-style-type: none"> • General public; • Press; • Policy makers and regulators; • Interest organisations/NGOs; • Investors; • Farmers & Cooperatives; • End-users; • Agricultural (independent) advisory services; • IoT technology providers; • Business support organisations; • Scientific community.

Sowing

The sowing phase will be implemented between M1-M9 of the project.

This phase will focus on developing tools to raise awareness about the project and inform about its aims and objectives.

Firstly, a project identity will be developed to provide a common branding to the project. This includes developing common formats and briefings to create uniformity of the IoF2020 communication activities. An early stakeholder analysis will take place to help identify the most relevant stakeholders in the field and their viewpoints in relation to the IoT technologies. In this phase, the ecosystem building strategy will also be developed. The milestone of this phase will be inauguration of the project at the kick-off event.

Main target groups of the sowing phase are:

- Consortium partners;
- Trial leaders;
- Use cases.

Basic communication tools to be used in the implementation of the sowing phase include:

- Project identity (e.g. logo, icons for each of the trials and style guide);
- Website and formats, including templates for the IoF2020 official documents and presentations, leaflets, roll-ups banners and posters. Newsletters will be designed in H5mag format, thereby ensuring their optimal readability on all available electronic devices;
- Monthly meetings with ecosystem Chairs, which will aim to: 1) Wrap up trials and use cases activities; 2) See how WP5 can, in its capacity, help the WP2 trials and use cases for the promotion and communication of the results of the use cases; 3) Exchange information, experience and knowledge on the activities taking place within the trials and use cases.

Flowering

The flowering phase will be implemented between M9-M40 of the project.

This phase will focus on developing value chains and engaging in a dialogue with key stakeholders in the area.

Main target groups of the flowering phase are:

- Farmers & Cooperatives;
- End-users;
- Agricultural (independent) advisory services;
- IoT technology providers;
- Scientific community;
- Business support organisations;
- Investors;
- Interest organisations/NGOs;
- Policy makers and regulators.

In addition to the tasks performed within the sowing phase, main communication tools for implementing the flowering phase include:

- Newsletters and social media;
- Building media relations;
- Regulatory & events monitoring;
- Participation in events;
- Side events at the existing sectoral events (i.e. societal cafés, investor pitches etc.);
- Stakeholder event.

Harvesting

The harvesting phase will be implemented between M24-M48.

This phase will focus on keeping engaged already involved stakeholders and reaching out to a broad group of other external stakeholders (how are yet to be involved) by communicating success stories, market opportunities, scientific publications, societal interests and the latest policy developments. Activities performed within WP2, e.g. use cases and trials, will feed into the IoF2020 dissemination and communication activities at this stage. Also, close cooperation with WP4 and WP1 will be of crucial importance for implementation of this phase and hence considered as a key success factor for the consolidation of already built, yet sustainable IoF2020 ecosystem.

Main target groups of the harvesting phase are:

- General public;
- Press;
- Policy makers and regulators;
- Interest organisations/NGOs;
- Investors;
- Farmers & Cooperatives;
- End-users;
- Agricultural (independent) advisory services;
- IoT technology providers;
- Business support organisations;
- Scientific community.

Next to the tools used in the sowing and flowering phases, main communication tools in the implementation of the harvesting phase include:

- Policy recommendations (public affairs);
- Selection and training of the spokespersons;
- Video testimonials;
- Site visits and workshops for the end-users;
- Scientific publications;



- Final event.

4.2. GLOSSARY

The section presents project- and sector-specific vocabulary. It aims to explain all abbreviations that were used in this document.

AIOTI – European Alliance of IoT Innovation

CSA – Coordinating Support Action

EC – European Commission

EIP-AGRI - European Innovation Partnership on Agricultural Productivity and Sustainability

DG AGRI - European Commission Directorate General for Agriculture and Rural Development

DG CONNECT - European Commission Directorate General for Communications Networks, Content & Technology

KPI – Key Performance Indicator

IoF2020 – Internet of Food & Farm 2020

IoT – Internet of Things

LSP – Large Scale Pilot

PA – Precision Agriculture

WP – Work Package