Open Call document IOF2020

document identification

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| Project Acronym | **IoF2020** |
| Project Full Title | Internet of Food and Farm 2020 |
| Project Number | 731884 |
| Starting Date | January 1st, 2017  |
| Duration | 4 years |
| H2020 Call ID & Topic | H2020-IOT-2016 |
| Date | June 4, 2018 |

table of contents

1. Overview of the IOF2020 Open Call 4

2. The current IoF2020 Use Cases and Stakeholders 5

2.1. IoF 2020 Use Cases – grouped in 5 Trial Areas 5

2.2. Main Use Case Characteristics 6

2.3. Stakeholder Involvement 6

3. Objective of the Open Call and major challenges 8

4. Available budget and Call Schedule 9

5. Eligibility criteria 10

6. Selection criteria 11

7. Funding procedure 12

7.1. Funding in phases 12

8. Annex I 13

8.1. Quick scan for new technologies in IoF2020 13

8.2. Main Characteristics of the current IoF2020 Use Cases 15

9. Annex II – Selection Criteria 23

# Overview of the IOF2020 Open Call

The internet of things (IoT) has a revolutionary potential. A smart web of sensors, actuators, cameras, robots, drones and other connected devices allows for an unprecedented level of control and automated decision-making. The project Internet of Food & Farm 2020 (IoF2020) explores the potential of IoT-technologies for the European food and farming industry.

The goal is ambitious: to make precision farming a reality and to take a vital step towards a more sustainable food value chain. With the help of IoT technologies higher yields and better-quality produce are within reach. Pesticide and fertilizer use will drop or phased out and overall efficiency is optimized. IoT technologies also enable better traceability of food, leading to increased food safety.

Nineteen use-cases organised around five trials (arable, dairy, fruits, meat and vegetables) develop, test and demonstrate IoT technologies in an operational environment in Europe, benefiting both conventional and organic agri-food chains, with the first results expected in the first quarter of 2018.

IoF2020 uses a multi-actor approach focusing on user acceptability, stakeholder engagement and the development of sustainable business models. IoF2020 aims to increase the economic viability and market share of developed technologies, while bringing end-users’ and farmers’ adoption of these technological solutions to the next stage. The aim of IoF2020 is to build a lasting innovation ecosystem that fosters the uptake of IoT technologies. Therefore, key stakeholders along the food value chain are involved in IoF2020, together with technology service providers, software companies and academic research institutions.

The current 19 use cases are a good starting point, but still just a beginning. Therefore, IoF2020 is preparing an open call that will allow us to ask new teams to join our journey within the Internet of Food and Farm to **enlarge the IoF2020 ecosystem and create more impact in the European food and farming sector**.

This document presents the IoF2020 open call, detailing the request for proposals as well as explaining the underlying procedure for selecting the most appropriate ones.

Chapter 2 is presenting the current 19 use cases of the IoF2020 project, detailing the application areas and IoT technologies being deployed. Chapter 3 is describing the objective of the IoF2020 open call, detailing specific challenges that shall be addressed by the proposals to be submitted. Chapter 4 is detailing the available budget and underlying schedule for proposal submission, evaluation and selection of the most appropriate ones. The chapters 5 and 6 are explaining the eligibility and selection criteria that will be used for evaluating the submitted proposals. Those criteria shall also help the proposers to understand of what is considered relevant for achieving a high impact and assuring subsequent uptake of the proposed undertakings. Chapter 7 finally outlines the funding procedure. Teams submitting a proposal shall reflect this in their overall work plan to facilitate their interaction with the overall IoF2020 team.

# The current IoF2020 Use Cases and Stakeholders

This chapter describes the current IoF2020 project and the 19 use cases that are realised.

The goal of Internet of Food & Farm 2020 (IoF2020) is to make precision farming a reality and to take a crucial step towards a more sustainable and transparent food supply chain. With the help of Internet of Things (IoT)-technologies, farmers of the future are expected to produce higher yields and better-quality food products, with less use of pesticides, fertilizer, and water. Furthermore, IoT technologies also enable better traceability of food, leading to increased food safety.

In 2017, the IoF2020 project has established an initial community with diverse European stakeholders, developing innovative IoT-based solutions for the European food and farming industry. Nineteen use-cases organised around five trials (arable, dairy, fruits, meat and vegetables) develop, test and demonstrate IoT technologies in an operational environment in Europe, benefiting both conventional and organic agri-food chains.

## IoF 2020 Use Cases – grouped in 5 Trial Areas

Figure 1 presents the geographical distribution of the IoF2020 use cases, while they are grouped by subsectors in so-called “trials”. As several use cases are realised in different sites, Figure 1 shows the spread over 28 sites in different European regions. Table 1 in Annex 1 gives a more accurate overview of countries involved.



Figure 1: Map of the current IoF2020 use case sites in Europe divided over the five subsector trials (see: [www.iof2020.eu/trials](http://www.iof2020.eu/trials))

IoF2020 is searching for additional use cases that will complement the current use cases. At the same time, it is envisaged that proposers will consider the following potentials:

* Extending the technological and business model dimension with aspects that are currently not addressed,
* Leveraging and using current use case work and knowledge,
* Enhancing current achievements based on most recent developments with respect to the state of the art in IoT technology and business processes in food and farming.

IoF2020 is aiming at the realisation of innovative IoT based solutions. Every proposal submitted shall explain its novelty and how it intends to present its results to a larger target audience and specifically to European stakeholders from the food and farming sectors. Therefore, the following shall be highlighted:

* Envisaged solutions shall be deployed in real world settings and used by a sufficient amount of end users in daily practice for a proper validation and collection of results for dissemination.
* Proposals shall balance novelty and maturity of the envisaged IoT based solutions for being able to involve real end users. Envisaged solutions must not just aim at a “proof of concept”, but being able to clearly validate a specific feature promising to realise a clear value proposition for the related end users.
* The reuse of results and knowledge provided by the current 19 use cases and envisaged cooperation of the stakeholders shall be explained. This needs to be reflected in the work plan, further detailing the envisaged support and effort it will imply for the existing use case teams.
* Reuse of existing results and knowledge shall also detail potential issues with respect to the usage of datasets and/or intellectual property that current end users would be expected to provide for a proper implementation of your solution.
* The envisaged novelty can be realised in the deployed IoT based technology, the envisaged business model and/or in the business processes to be realised by the end-users.

## Main Use Case Characteristics

IoF2020 encourages proposers to learn from the use case results that were delivered in the first quarter of 2018 as well as to join the series of events with IoF2020 partners to discuss collaboration potentials with existing use cases in detail.

Table 1 in Annex 1 lists the nineteen use cases for each trial and indicates the application areas addressed, the chain roles and the countries involved. More information about the use cases can be found at the IoF2020 website (<https://iof2020.eu/trials>). There are also public deliverables available from the website with more information about the use cases (<http://www.iof2020.eu/about/deliverables>).

Table 2 in Annex 1 provides an overview of the enabling technology that is initially deployed in the 19 use cases. Please take into account that each proposal needs to explain the expected impact of an IoT based solution. Therefore, simple repetitions of similar solutions are not searched for, but as soon as a proposing team sees a significant added-value when validating use case results and knowledge in e.g. clearly deviating settings/context, with additional business models, very large amounts of end-users (e.g. farmers) or also complementary IoT based solutions proposals would be considered relevant.

However, please also check the eligibility and selection criteria in chapter 5 and 6. At the same time, please also use the opportunity to get in direct contact with the IoF2020 project and possibly even the use case teams during the upcoming event series, presenting the current solutions and offering to discuss potential solutions.

## Stakeholder Involvement

Figure 2 provides an overview of the various stakeholders that are involved in the current IoF2020 ecosystem. The key stakeholders are part of the use cases, but also other groups (e.g. policy-makers, general public) are included through all kind of communication and dissemination activities. More information can be found at [www.IoF2020.eu](http://www.IoF2020.eu) and deliverable 5.3 Ecosystem Building Strategy.



Figure 2: Overview of the stakeholder groups that are involved in the IoF2020 ecosystem

Teams proposing additional use cases shall reflect on which stakeholders will be relevant for their activities as well as outline those specific stakeholders that will be directly involved from their side. Please detail this also for stakeholders that would not become a direct participant signing a contractual agreement with IoF2020. A letter of intent (LoI) signed by such stakeholders could extend the explanation in the proposal. Such a LoI could shortly outline the envisaged type of involvement and might even highlight tangible support that would be offered (e.g. amount of effort for supporting the project realisation that would be offered in kind, infrastructure that could be used by the proposers, end users that would be involved in tests, or also budget that would be invested.

# Objective of the Open Call and major challenges

IoF2020 looks for proposals that present in a convincing way a high impact on the supply chain, a high level of technical feasibility & innovation as well as a strong economic sustainability. Proposals should be supported by a coherent team of stakeholders that represent the entire IoT supply chain (technology providers, service integrators, end-users, etc.). As IoF2020 is following the multi-actor approach[[1]](#footnote-2), proposals submitted by single parties will not be considered.

*Increasing impact*

The primary objective of the Open Call is to increase the scale and impact of the IoF2020 initiative. The Open Call will allow new use case teams to join our journey within the Internet of Food and Farm to enlarge the number of IoF2020 stakeholders and create more impact on the European farming and food sector. The new use cases should substantially enlarge the number of actual IoT-users, in areas and production sectors with growth potential. New use case teams are preferably led by partner from the private business sector. The participation of innovative SMEs in use cases is encouraged and could enable SMEs to test innovative technologies and services.

*Major challenges*

For the Open Call we are looking for highly impactful and market-ready IoT innovations that will be validated and demonstrated, following the multi-actor approach in:

1. **IoT use cases in new regions**

Figure 1 and Table 1 clearly show that the eastern part of Europe is not or less covered, and, to a lesser extent, also the northern part of Europe. Applications for new use cases in EU member states that are not yet involved in IoF2020, including associated countries, are therefore encouraged to apply[[2]](#footnote-3).

Although the ecosystem and context in other countries can be very different from the countries where current use cases take place, it is encouraged to learn from the existing use cases reusing IoT innovations and technologies that are already developed and tested. New use cases can of course also choose to combine their own equipment with useful elements from current IoF2020 solutions. In this way it is expected that the impact of current IoF2020 solutions will be maximized.

1. **Post-farm use cases and other sectors**

We are welcoming use cases from EU member states already involved in IoF2020, that extend the impact of IoF2020 in the post-farm segments of the supply chain. Complementary areas could be in e.g. logistics, processing, retail and in particular the end-consumer. Use cases addressing other subsectors[[3]](#footnote-4) (other crops, animals, etc.) are also encouraged, as well as use cases addressing new business models with focus on SMEs.

From Table 1 it can be concluded that current use cases are focusing on the farm level. In particular, this holds for the arable and dairy trial. Although a fair number of use cases are including logistics and processing, they are still primarily focused on the farm level, when looking deeper into the activities. Only a few use cases are including consumer aspects.

Applicants do not have to choose between the two challenges but can also address both challenges at the same time, which also has consequences for the available budget (see next section).

Technology is moving fast in the IoT domain and IoF2020 should account for that. Table 2 in Annex I shows that already quite some IoT technologies and applications are being deployed in the current use cases. At the beginning of Annex I a list of new technologies and applications is presented based on a quick scan of the current use cases. Including new technologies and applications will be encouraged in proposals for use cases. On top of that, proposals for realising IoT based solutions shall aim at interoperability, replicability and reuse of the envisaged results. To achieve this, specifically the following aspects shall be considered when elaborating the proposals:

* + Interoperability:
	IoT based solutions that will be submitted in the open call shall make use of established open standards as far as possible. Proposals shall explain on how the solutions will avoid a vendor lock-in by pointing out key interoperability points in the architecture and which standards-based mechanisms will be used at those points, or where the teams are actively contributing aligning to the current work of related standard development organisations (e.g. AEF, AgGateway, ETSI, GS1, ISO, ITU-T, UNCEFACT).
	+ Replicability:
	The IoF2020 project will offer an IoT catalogue that will present the solutions deployed and validated in the scope of the project. Also the proposals selected in the scope of the open call need to confirm that they will provide access to their lessons learnt, best practices, tutorials, guidelines and an overview of deployed technical components. Open Source licenses and free access to the developed software components is not a must, but considered desirable. However, a tangible business model is considered a prerequisite that shall finally correspond to the selected licensing scheme and envisaged commercialisation strategy.
	+ Reuse:
	Proposals shall explain on how they assure to reuse existing technological components to avoid reinventing the wheel. Reuse of results developed and/or validated in the initial IoF2020 use cases including open initiatives like FIWARE as well as from other open sources initiatives will be evaluated positive.

Hence, a general objective of the proposed use cases shall be to validate IoT based solutions in a way that they will facilitate an understanding by different stakeholders on how IoT and related technologies can be applied in the food and farming industry, with a view of creating interoperable and portable solutions. Therefore, the identification of “interoperability points” shall be mapped to the use case’s architecture.

A generic IoF2020 architecture and related interoperability points are described in Deliverable 3.3, which is available on the IoF website ([www.iof2020.eu/about/deliverables](http://www.iof2020.eu/about/deliverables)).

# Available budget and Call Schedule

Based on the specific challenges that were described in the previous chapter the IoF2020 Open Call budget is subdivided into two separate tranches according to the abovementioned specific challenges:

1. New EU regions: ± 3.5 Mio Euro
2. Post-farm stakeholders and other sectors : ± 2.5 Mio Euro

The requested funding for each proposal may vary between 300 - 500 kEuro depending on the challenges that are addressed:

* Proposals focusing on challenge 1 (new regions) and only reusing and validating experience, results and knowledge of an existing use case in a new region are eligible for requested funding of up to 300 kEuro.
* Proposals focusing on challenge 2 are eligible for requested funding of up to 300 kEuro.
* If proposals additionally introduce new mature IoT technology or include test beds in more countries, a larger requested funding of up to 500 kEuro can be requested.
* Proposals covering both challenges (for example: post-farm/other sectors in a new region) are eligible for requested funding of up to 500 kEuro. The budget for financing such proposals will come from the two tranches equally (i.e. 50-50%).

*Current planning*

The IoF2020 open call will open in June 2018. The deadline for proposals is 30 September 2018. The selection process and the contracting will take place in October, November and December 2018 so that the new use cases can start in January 2019.

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| Schedule |  |
| *Date* | *Open Call Step* |
| June 5, 2018 | Open call official text publication |
| September 30, 2018 | Deadline for receiving applications |
| October 31, 2018 | Communication of the evaluation results to applicants |
| December 31, 2018 | Contracting with successful proposals and prepayment |
| January 1, 2019 | Start of new use cases |

# Eligibility criteria

In order to be eligible, participants have to comply with the following eligibility criteria:

* Preregister your proposal on the IoF2020 website before 31 August 2018 17:00 CET through the online form on the IoF2020 website ([www.iof2020.eu/opencall](http://www.iof2020.eu/opencall)).
* Submit your proposal (in English) **before 30 September 2018 17:00 CET** through the online submission form on the IoF2020 website ([www.iof2020.eu/opencall](http://www.iof2020.eu/opencall)). The proposal must be structured according the proposal template. The consortium declaration must be signed and added to the proposal.
* A new use case should apply the multi-actor approach, including the entire IoT value chain (i.e. technology providers, business integrators, end-users) and includes at least 1 SME[[4]](#footnote-5). Thus, proposals submitted by single parties will not be considered.
* Technology readiness level (TRL): use cases must have a minimum starting TRL of 6 and target TRL of 8-9.
* Each partner in the team should have a substantial input in the project of at least 10% of the total budget. Subcontractors can also participate, up to a maximum of 10% of the total budget.
* Private partners in the team will receive funding for maximum 70% of the total costs of their contribution in the project. At least 30% of the costs should be brought in by themselves. (see H2020 funding rules for Innovation Actions: <http://ec.europa.eu/research/participants/docs/h2020-funding-guide/grants/applying-for-funding/find-a-call/what-you-need-to-know_en.htm>)
* All partners must be legal entities established and based in one of the EU Member States or an H2020 Associated country as defined in H2020 rules for participation[[5]](#footnote-6). However, end-users outside the EU or associated countries are welcome to be involved as end-users/customers of the proposed solution (e.g. representing stakeholders in the agri-food value chain), while not receiving any budget. It would also be considered positive if such end-users would offer their support (e.g. in terms of person effort, infrastructure, budget) in realising the proposed new use case.
* Be directly responsible for the preparation, management and execution of the plan.
* Do not receive any other funding for the same activities in the project.

Current IoF2020 beneficiaries are excluded from application. The current IoF2020 beneficiaries will however be able to support the new use cases with up to 8% of the proposal budget. If you expect an added value by an involvement of the existing IoF2020 partners, please clarify this in your proposal, after agreement with the current IoF2020 beneficiary involved. Shortly detail this with the following:

* Envisaged type and purpose of involvement of current IoF2020 partners
* Expected amount of effort that would be required
* Type of results and knowledge that would be requested, also explaining in which way it would be (commercially) used
* Amount of meetings, trips or other activities required by existing partners

# Selection criteria

Independent external evaluators (both business and technical evaluators) will analyse and evaluate each proposal. Each proposal will be evaluated by one business evaluator and one technical evaluator.

The criteria for selecting and awarding the best proposals are:

1. **Suitability of the overall proposal**
Concerns the general fitness of the proposal concerning the topic of the IoF2020 call, the composition of the consortium and what will be delivered for the requested budget.
2. **Geographical impact: cross-border test beds**
Concerns the coverage of the involved stakeholders over different member states, especially test-beds in which the proposed solution is validated and demonstrated. If in new regions existing test beds are already available, it is encouraged to use those.
3. **Business impact: business plan and scalability**The proposed product or service should be accompanied by a viable business model that is scalable in the future. Proposals need to confirm that they will provide access to their lessons learnt, best practices, tutorials, guidelines and an overview of the realised solution.
4. **Technology impact and use of standards**The proposed product or service must consist of an innovative, credible IoT concept and make significant use of data. Proposals for realising IoT based solutions shall demonstrate
5. interoperability,
6. replicability,
7. reuse of the envisaged results.

Results shall be presented to a wider stakeholder audience as well as presenting the results in the IoF2020 related IoT catalogue.

1. **Sustainability impact**
IoF2020 has committed itself to improvement of sustainability, e.g. by achieving UN Sustainable Development Goals. It should be indicated how the proposal contributes to improving sustainability in a realistic manner.
2. **Financial impact**Thisdemonstrates financial support from public or private resources either from outside or within the proposing consortium. Proposers need to provide tangible evidence for the committed external financial support in specific relation to their submitted proposal. General statements or basic funding sources for organisations are not considered as a specific commitment. The related payment transfer needs also to be proven along a potential use case realisation according the envisaged contract fulfilment. The later absence of such financial support could lead to the termination of the contract and/or reduction of related payments.

Annex II provides the sheet with selection criteria that will be used by the evaluators containing more specific information, also on weighting and rating.

# Funding procedure

## Funding in phases

The duration of new use cases will normally be 2 years, with a minimum of 1 year. The contracts will be deliverable-based. The selected proposals will receive funding for a first phase (pre-payment: 40% of total budget). After satisfactory completion of the first (number of) deliverable(s), including the interim report, the proposals will get the second payment (30%). After satisfactory completion of the second (number of) deliverable(s), including the final report, the third and last payment (30%) will follow.

# Annex I

## Quick scan for new technologies in IoF2020

Below a list is provided of potential new technologies that could be further explored and deployed by the IoF2020 open call. This is a list of promising new technologies that require further work and offer potential, but not the result of a complete and fully systematic gap analysis.

The Open Call is not looking for technologies as such, however, new use cases can earn a bonus if they apply innovative technology.

IoF2020 already offers a broad catalogue of technologies that allowed the use cases (UCs) to develop their first minimum viable products (MVPs). Nonetheless, it may be very useful and strategically wise to incorporate technologies that can have a positive impact in multiple UCs and possibly Trials. Thus, these technologies should be horizontally applicable in IoT. Blockchain and big data are only two examples of the above described category. Here follows a list of possible additional technologies that could be considered as new to the current use case although this list doesn’t pretend to be exhaustive:

* + Security by Design, facilitating e.g.
* Authorisation & authentication in distributed system architectures
* Identity and role based management for outdoor solutions serving multi-tenants
* Management of access rights to data – taking into account decentralised settings, without central governance and distributed data storage. Allowing information sharing along supply chains, while enabling context based access or revocation of access rights.
* Secure encryption and management of decryption based on ownership of objects – e.g. allowing only the temporary owner of products to access related data
* Dynamic presentation of data according to purpose. Allowing to use same data baselines to enable reporting for different purpose – from provision of anonymised data to the detailed reporting e.g. in case of crisis situations. At the same time, building upon existing IoT and agri-food related standards.
	+ Indoor positioning of moving objects
* Realising indoor positioning as an add-on to outdoor positioning, as those moving objects are both indoor and outdoor. One solution fitting both conditions would also be an alternative.
* Validating communication technology alternatives for indoor settings, while the moving object might also move to an outdoor setting (e.g. a cow in a farm and on the field), taking into account existing solutions (e.g. WiFi, BLE) as well as upcoming innovative solutions.
	+ Long range low power communication
* Not specific to a certain communication technology (e.g. based on LoRa, SigFox or NB-IoT)
* Validating scalability of operation of thousands or even millions of devices at one place
* Usage under harsh conditions
* Deployment in the field, able to satisfy demands on environmental protection (e.g. usage of batteries in outdoor settings)
	+ Outdoor positioning at low power consumption – alternative to classical GPS solutions
* Positioning with higher accuracy, compared to current solutions (e.g. SigFox based positioning is rather not sufficient for precision agriculture or positioning of objects)
* Enabling to find an object by position, especially if an object cannot be discovered by sight.
	+ Context-based decision support
* Making use of FIWARE context broker based solution, based on standardised interfaces (i.e. NGSI 10)
* Developing context models for specific purpose and an open source based approach for open and free usage
* Methodology for context model development and usage
	+ Low cost weather stations
	+ Theft protection of IoT devices that are exposed in a rural setting
	+ Peer-to-peer networks in rural settings for local data exchange, allowing larger data volume (e.g. compared to LoRa solutions) and trusted connections.
	+ Realising a MEMS based sensor and actuator system for precision farming in a real world setting
* Development and validation of a business model canvas
* Aiming at a tangible solution, while including the required agricultural knowledge base for smart control
	+ Communication between FMIS and machines of the farmer.
* Based on ISOBUS approach developed in IoF2020 use case 1.4 (Farm Machine Interoperability)
* Involving visualisation of real-time data from machines
* Validating the usage with different types of FMIS and machinery from different agricultural equipment manufacturers
* Validating the usage with a large amount of farmers also in situation of sharing machinery by numerous farmers using FMIS from different software providers
	+ IoT based solution, generating big data and making use of the data with machine learning algorithms
* Realising a tangible solution based on a real world setting
* High focus on usability and exploitation of the knowledge e.g. for precision farming.
	+ IoT Marketplace Innovations

## Main Characteristics of the current IoF2020 Use Cases

IoF2020 encourages proposers to learn from the use case results that were delivered in the first quarter of 2018 as well as to join the series of events with IoF2020 partners to discuss collaboration potentials with existing use cases in detail.

The following Table 1 provides and overview of the 19 use cases, sorted by the five trials. It shortly outlines the application areas addressed, the agri-food chain roles and the countries involved. More information about the use cases can be found at the IoF2020 website (https://iof2020.eu/trials).

Table 1 The IoF2020 Trials and Use Cases divided over several EU countries

| **Trial** | **UC** | **Name** | **Short Description** | **Application Areas Addressed** | **Chain Roles** | **Countries[[6]](#footnote-7)** |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **The Internet of Arable Farming** |
| **T1 Arable** | **1.1** | Within-field management zoning  | defining specific field management zones by developing and linking sensing- and actuating devices with external data  | Management zoning of arable fields; Crop protection; Yield prediction | Farming, Logistics | **NL**, DE, BE |
| **1.2** | Precision Crop Management | smart wheat crop management by sensors data embedded in a low-power, long-range network infrastructure | Nitrogen and water monitoring; Precision irrigation control; Crop growth optimization | Farming | **FR** |
| **1.3** | Soya Protein Management | improving protein production by combining sensor data and translate them into effective machine task operations | Protein monitoring & forecasting; Rational water usage (irrigation); Mechanical weeding | Farming | **IT** + Danube countries (CH, RS, **AT**, SK, HR, RO, CZ, UA) |
| **1.4** | Farm Machine Interoperability | data exchange between field machinery and farm management information systems for supporting cross-over pilot machine communication | Sustainable soil tillage; Machine to machine communication for application of task maps; Farm equipment data sharing | Farming | **NL**, DK, DE, BE |
|  |  |  | **The Internet of Dairy Farming** |
| ****T2 Dairy**** | **2.1** | Grazing Cow Monitor | monitoring and managing the outdoor grazing of cows by GPS tracking within ultra-narrow band communication networks | Cow Tracking and Tracing; Pasture Time Monitoring | Farming | **BE**, **NL** *(future)* |
| **2.2** | Happy Cow | improving dairy farm productivity through 3D cow activity sensing and cloud machine learning technologies | Real-time 3D monitoring of dairy cow activity; Animal Health Management; Cow Fertility Management | Farming | **NL** |
| **2.3** | Silent Herdsman | herd alert management by a high node count distributed sensor network and a cloud-based platform for decision-making | Monitoring of animal behaviour (motion); Early detection of livestock diseases  | Farming | **UK** |
| **2.4** | Remote Milk Quality | remote quality assurance of accurate instruments and analysis & pro-active control in the dairy chain | Remote quality monitoring of raw-, half- and end-products; Validation/calibration quality info; Product composition analysis (incl. fresh-grazed grass & cow pregnancy indicators) | Processing, Consumption | **NL** |
|  |  |  | **The Internet of Fruits** |
| ****T3 Fruit**** | **3.1** | Fresh table grapes chain | real-time monitoring and control of water supply and crop protection of table grapes and predicting shelf life | Smart Irrigation; Variable Rate Spraying; Smart Post-Harvest Processing & Packaging | Farming, Packaging | **IT, EL**, BE |
| **3.2** | Big wine optimization | optimizing cultivation and processing of wine by sensor-actuator networks and big data analysis within a cloud framework | Pest Management; Selective Harvesting; Wine Cellar Monitoring | Farming, Processing | **FR, IT** |
| **3.3** | Automated olive chain | automated field control, product segmentation, processing and commercialisation of olives and olive oil | Fertigation; Harvesting Logistics; Smart Mill Processing | Farming, Processing | **ES, EL** |
| **3.4** | Intelligent fruit logistics | fresh fruit logistics through virtualization of fruit products by intelligent trays within a low-power long-range network infrastructure | Returnable Transport Items (RTI) for Fruits packaging and transporting; Field to Fork logistics; Super Market Placing and Monitoring | Logistics,Consumption | **DE, NL** |
|  |  |  | **The Internet of Vegetables** |
| T4 Vegetables | 4.1 | City farming leafy vegetables | value chain innovation for leafy vegetables in convenience foods by integrated indoor climate control and logistics | Advanced sensing of crop conditions in indoor farming; Automatic execution of growth recipes; Integrate production with processing & distribution | (City) Farming, Logistics | **NL** |
| 4.2 | Chain-integrated greenhouse production | integrating the value chain and quality innovation by developing a full sensor-actuator-based system in tomato greenhouses | Traceability and monitoring ambient conditions of fresh tomatoes along value chains; Pesticide residue management; Energy efficiency management | Farming, Logistics, Consumption | **ES**, IT |
| 4.3 | Added value weeding data  | boosting the value chain by harvesting weeding data of organic vegetables obtained by advanced visioning systems  | Automated weed control; Crop monitoring and harvest prediction based on weeding data; Optimizing weeding efficiency | Farming | **NL**, AT |
| 4.4 | Enhanced quality certification system | enhanced trust and simplification of quality certification systems by use of sensors, RFID tags and intelligent chain analyses | Compliance to PDO, organic and GlobalGap certification; tracking and tracing, verification of product origin and production method | Farming, Logistics, Consumption | **IT**, ES |
|  |  |  | **The Internet of Meat** |
| T5 Meat | **5.1** | Pig farm management | Optimise pig production management by interoperable on-farm sensors and slaughter house data | Pig production monitoring and early warning; Boar taint detection; Informing consumers about production conditions | Farming, Processing, Consumption | **BE, NL**, IT |
| **5.2** | Poultry chain management | Optimize production, transport and processing of poultry meat by automated ambient monitoring & control and data analyses | Poultry growth monitoring and weight prediction; Monitoring of picking & logistics; Poultry category assessment slaughterhouse | Farming, Logistics, Processing | **ES**, BE |
| **5.3** | Meat Transparency and Traceability | Enhancing transparency and traceability of meat based on an monitored chain event data in an EPCIS-infrastructure | Transparency food safety and quality information; Cold chain monitoring; Quality decay prediction and pro-active alerts | Farming, Logistics, Processing, Consumption | **NL**, DE |

Table 2 is generally structured according to an underlying architectural model, mainly differentiating the technology in three main layers. The IoT device layer is grouping all the hardware that is mainly used for sensing and actuating, usually deployed in the end-user related environment. The IoT integration and communication layer is listing those components that are usually kind of third party systems or platforms taking care for data gathering as well as data aggregation and storage. The IoT application layer is listing the software that is providing the key features for the envisaged end-user related solutions. It should be noted that the presented infrastructure reflects the initial results for test and validation, while this will be further extended along the realisation of the IoF2020 project.

This shall help potential proposers to understand the current dimension for test and validation. Envisaged proposals can also propose new opportunities to scale up the initial solutions with their end-users as well as integrating with their new developments to be proposed. New use cases are encouraged to think about possibilities to reuse IoT technology from current use cases, for example by combining current IoF2020-solutions with their own equipment. Applicants can ask questions about interoperability or other important issues and subsequently IoF2020 will provide support and guidelines via FAQ’s on the IoF2020-website.

*Table 2 Overview of the IoT components of the current Use cases and size of deployment in test beds*

| **Tri-al** | **UC** | **IoT Device Layer** | **IoT Integration/ Communication Layer** | **IoT Application Layer** |
| --- | --- | --- | --- | --- |
| **T1 Arable** | 1.1 | 30 sensors for soil moisture, Veris soil scanner, machine control, yield sensors, indoor climate, crop quality, 4 weather stations, 3 GEO-localization units | Lora Network, 365FarmNet, Zoner, Crop-R and Akkerweb platforms, Cloudfarm FMIS | Weather forecast service, Akkerweb agro-eco algorithms; GIS, zoning and T&T modules |
| 1.2 | 120 sensors for water potential, soil temperature, reflectance and leaf area index, 3 weather stations (wind speed, solar radiation, air temperature, air humidity, rain) | 30 gateways, Arvalis IoT platform; 365FarmNet; Atland FMIS | Weather forecast service, Arvalis agro-eco algorithms  |
| 1.3  | 20 soil moisture and crop quality sensors; accurate GNSS receivers; cameras for weed detection, 4 weather stations, 2 soil scanners | Platform 365FarmNet, FMIS | Weather forecast; Agronomic models of extension services |
| 1.4 | Soil and yield sensors on 2 tractors, 2 soil tillage implements and on 1 combine; 10 stations for precipitation, humidity, air and soil temperature, soil moisture and 1 weather station | 365FarmNet, ThingWorx IoT platforms | Soil-plant-atmospheric algorithms; Weather forecast; GIS and zoning tool; Traffic optimization modules |
| **T2 Dairy** | 2.1 | 75-100 stickntrack GPS-trackers, BLE tags | UNB (Sigfox and LoRa)IoT platform 365FarmNet | Grazing Cow Monitor app + API. |
| 2.2  | 500-700 neck/leg transmitters with accelerometer RF sensors for dairy cow activity in 3D space50-60 intelligent routers | Base Station Device oData, Connecterra IoT platform, connection to 365FarmNet | Cloud-based decision support system, analytics cow centric behaviour, prediction algorithm |
| 2.3  | 150-200 Afimilk Silent Herdsman devices | Hypercat, connection to 365Farmnet | Collar-based analytics, early illness detection |
| 2.4 | 20-30 InfraRed sensors (FTIR) to measure milk quality composition | Qlip platform for automatic calibration and validation, connection to 365Farmnet | QA data visualization, remote alerts, interventions harmonization, milk composition/quality analytics |
| **T3 Fruit** | 3.1 | 30 sensors/ measurement devices for crop evapotransp. (ETc); soil water content (VWC); Stem Water Potential; Berry Growth Rate; Sap-flow meter, Dendrometer, Stem psychometer sensors. 30 irrigation systems controlling 90 solenoid valves and hydrometers. 100 BLOW gas sensors  | GPRS/4G and long RF communication; cloud IoT data management based on state of the art platform (e.g. Cassandra) and processing using state of the art technologies such as Apache Flink & Spark. | Crop and post-harvest monitoring (irrigation, pest and quality alarms);Irrigation DSS, Prediction software for crop management and the harvest period, Shelf-life prediction tool |
| 3.2 | 150 Multi-Sensor/ actuator smart nodes, 10 Video Sensors, 300 sensors for detecting IR and VIS absorbance and temperature (cellar) | 5 Gateways, SensiNact IoT platform; wine cloud system (cellar). | Management software for Wine Production from process to wine. |
| 3.3 | 12 soil/air sensors for water, temp. nitrates, conductivity, humidity, radiation; 12 data logging units, 12 autonomous solar energy units, 12 fertigation actuators, 6 ISOBUS on-board sensors; 3 temperature/pressure sensors and 3 electronic noses (oil mill), Product barcodes/QR, RFID | 12 wireless sensors networks (HSPDA, UMTS, GPRS, GSM), 12 gateways, 1 global SIM data comm., 1 integration service bus  | Application Modules (3 implementations): Field Operations and Machinery Control; Field decision support (alerts, models); Olive mill Control; Traceability; Warehouse Logistics |
| 3.4 | 1000 passive RFID transponders with environmental sensors (temperature, relative humidity, illumination and methane) in trays, handheld and fixed RFID readers | EPCIS and V-Track AutoID middleware system, LORA and package sensor platforms for data access | V-Track application layer, Jesper business rule engine (open source and Cassandra big data database (open source). Reader-based applic. |
| **T4 Vegetables** | 4.1 | Advanced crop sensors (100x each) for temperature, humidity, CO2, pH, nutrition, air flow, plant observers, electrical conductivity, 15000 LED lighting devices | 30 wired and/or ZIgbee connections from sensors to city farming system | 1 production control, 1“Green Cloud”climate control(incl. irrigation) system |
| 4.2 | 35 sensors for temp. & moisture, humidity, CO2, water supply, soil water; leaf wetness, and nutrients; 13 actuators for pulverization, dehumification, artificial light actuator, irrigation, CO2 enrichment actuator and biomass heating; 4 IP cameras and 4 weight devices | 1 webbased IoT platform, 3 WIFI networks, 3 Gateway NI CompactFieldpoints | Web Application for DSS:DSS production managing; DSS Deceases early-warning syst.DSS pest control; DSS for handling & transport managing |
| 4.3 | 6 RGB Cameras, GPS, timestampHandheld (Smartphone), 1-2 GUI (Touchscreen in tractor), 12 Weed actuators  | 1-2 local data storage & image pre-processing syst., 3-4 gateways, 2 WIFI networks, cloud IoT platform | Web application and smartphone app, 3 DSSs for Growth, Weed, Soil Monitoring |
| 4.4 |  35 sensors of volume, moisture and chemicals (in the field-min. 15); 100 digital traceability tags (100), QRs  | Web certification data platform  | 3 apps for data upload, query & aggregation app, traceability app for buyers/consumers |
| **T5 Meat** | 5.1 | 50 sensors for water & feed consumption, daily growth,cough monitoring and stable climate control; PigWise sensor; 8 RFID Readers (FEIG/DTE), 500 RFID Tags (HID Global); slaughterhouse recordings of 2000 pigs  | 1 IoT Data platform1 Virtus Middleware + LinkSmart Middleware components1 ebbits Adaptation Layer | Early Warning System Application; Boar Taint presence report linking with preventive measures; Data Analytics & Visualization |
| 5.2 | 110 sensors for temperature, humidity, luminosity, CO2, noise and ammonia (farms, trucks); 8 scales with integrated sensors & camera); 12 silo weight cells, 10 Sony SmartBands | GPRS/WIFI WSNs: 4 farms (TIBUCON) and 10 trucks WSNs, Bluetooth 4.0 SmartBands, Google Fit LiveLog, 1 IoT Data Platform & Middleware | Early Warning System, Birds Manipulation Assistant, Environmental Assistant, Production Management DSS, Data Visualization |
| 5.3  | 30 barcode/QR readers; 5-10 RFID gates at slaughterhouse and meat processor, about 100 temperature sensors and 5-10 cooling actuators at transport; temperature sensors and shop shelve actuators at test shop | 2 EPCIS repositories – IoT Data platform1 Discovery server | 2 Connectors, 1 Discovery App, 1 Aggregation App |

# Annex II – Selection Criteria

|  |  |  |
| --- | --- | --- |
| **Criterion** | Weighting | Rating |
| 1. **Suitability of the overall proposal**
 | (27%) | (max. 40) |
| * 1. Topic Coverage

This criterion assesses in how far the proposed solution covers the defined challenge of the open call | 1 | 0-10 points |
| * 1. Consortium composition & ability

This criterion rates in how far the consortium represents all necessary skills and experiences to develop and commercialise the proposed product or service. | 1 | 0-10 points |
| * 1. Value for money

This criterion rates to what extent the proposed activities and promised results justifies the requested budget | 2 | 0-10 points |
| 1. **Geographical impact: cross-border test beds**
 | (13%) | (max. 20) |
| * 1. Testbeds in more countries

Every application with a testbed in an additional member state receives extra points. The objective of this criterion is to extend the coverage of the IoF2020 use cases geographically, within the EU and/or associated countries.1 member state: 0 points; 2 member states: 5 points; 3 or more member states: 10 points | 2 | 0-10 points |
| 1. **Business Impact: business plan and scalability**
 | (20%) | (max. 30)  |
| * 1. Business Model

Credibility of the business planning regarding sustainable exploitation (including data brokerage), market entry & expansion, financial projections and resources. | 2 | 0-10 points |
| * 1. Scalability

This criterion rates the ability of the proposed solution to upscale quickly on the European and international markets.  | 1 | 0-10 points |
| 1. **Technology impact and use of standards**
 | (13%) | (max. 20) |
| * 1. IoT solution, concept and innovation

This criterion rates the innovativeness, credibility and feasibility of the technological IoT concept, and also security & data privacy.The proposed product or service should make significant use of data from connected devices or develop IoT devices itself.  | 1 | 0-10 points |
| * 1. Interoperability, replicability and reusability of the developed solution.

This criterion rates in how far the use case demonstrates interoperable, replicable and/or reusable components, systems or solutions. The usage of standards is highly appreciated, while using open system initiatives[[7]](#footnote-8) will be positively evaluated. The offering of open data is also considered as very valuable and will be evaluated positively. | 1 | 0-10 points |
| 1. **Sustainability impact**
 | (13%) | (max. 20) |
| * 1. Sustainability impact

This criterion rates in how far the proposed solution is able to contribute to sustainability improvement in a realistic manner. | 2 | 0-10 points |
| 1. **Financial Impact**
 | (13%) | (max. 20) |
| * 1. Co-funding - external

This criterion refers to external co-funding (e.g. from national/regional funds or private investors) for specific activities, that are originally developed for this proposal. This refers to specific activities or results that are clearly described in the proposal but will not be covered by the requested IoF2020 budget.15-30% co-funding: 5 points> 30% co-funding: 10 points | 1 | 0-10 points |
| * 1. Private funding – internal

This criterion refers to private funding (*i.e.* by one of the consortium partners) in terms of new equipment. This is about **additional** funding for private partners, on top of the mandatory own funding for private partners (30%).15-30% additional private funding (percentage of the total budget for the private partners): 5 points> 30% additional private funding (percentage of the total budget for the private partners): 10 points | 1 | 0-10 points |

1. The multi-actor approach means that projects must focus on real problems or opportunities that farmers or others who need a solution (“end-users”) are facing. It also means that partners with complementary types of knowledge – scientific, practical and other – must join forces in the project activities from beginning to end. As a result, projects with this approach are able to develop innovative solutions which are more ready to be applied in practice and cover real needs. See also <https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-brochure-horizon-2020-multi-actor> [↑](#footnote-ref-2)
2. see Article 7 of the Horizon 2020 Regulation (<http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf>). Legal entities from these countries can participate under the same conditions as legal entities from the EU Member States. Association to Horizon 2020 takes place through the conclusion of an International Agreement. [↑](#footnote-ref-3)
3. The open call should be in line with the scope of the topic published in the H2020 2016-2017 Work Programme. Therefore, it should be according to agriculture and the agri-food value chain. Forestry, aquaculture, fisheries and non-food crops are not part of the scope of the topic. [↑](#footnote-ref-4)
4. See also <http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_de> [↑](#footnote-ref-5)
5. <http://ec.europa.eu/research/bitlys/h2020_associated_countries.html> [↑](#footnote-ref-6)
6. Countries with test beds are indicated in bold. Other countries refer to the partners involved. See [http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Country\_codes](http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary%3ACountry_codes) [↑](#footnote-ref-7)
7. Initiatives like FIWARE, OpenIoT, Kaa, Nimbits, Eclipse IoT, Open Remote [↑](#footnote-ref-8)