



FAROMATICS

Farm Automation and Robotics SL

INVESTOR BRIEFING NOTE

February 2018

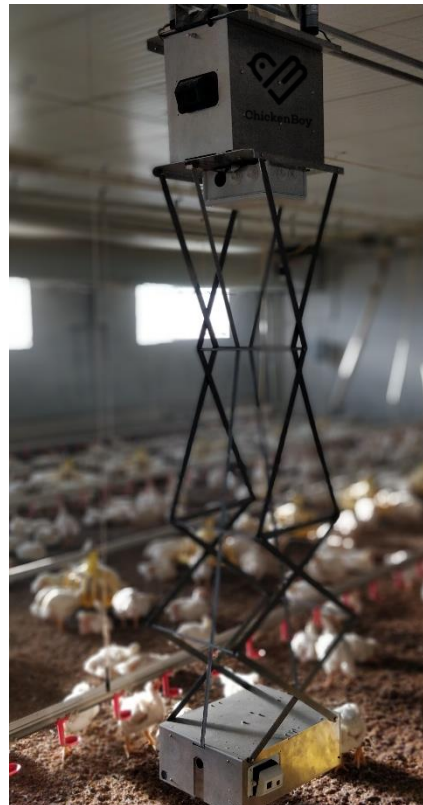
1 Purpose of the document

This **confidential document** contains information for investors into the early stage start-up Farm Automation and Robotics SL, established in Spain with company registration number B66814278. The company is looking to raise 500,000€ in equity, pre-sales or potentially interest-free, risk-free loans. The current document provides information for possible investors.

2 Executive summary

Rapid population growth is expected to lead to a dynamic increase in chicken meat production, which can only be answered by intensive farming. However, citizens are increasingly concerned about the living conditions of intensively farmed chickens. Crowded chicken houses lead to leg diseases, poor air quality, epidemics and other health and welfare issues. With unit profits being very low, chicken farmers need to produce in high volumes to remain profitable while providing the best possible living conditions for chickens to ensure their “social license to operate”¹.

We have created the solution ChickenBoy, a robot that gets close enough to chickens to detect their needs when they arise. ChickenBoy is a disruptive new technology that balances animal welfare with productivity by using machine learning, pattern recognition and a combination of sensors to provide optimal decision support to farmers and other users. It represents an intelligent, robotic broiler surveillance solution that measures vital parameters at the level of chickens for observation and detection of health and welfare issues (body temperature, gastrointestinal diseases, healthy feeding, leg disorders, etc.). It is an autonomously moving smart observation platform with on-board capability for vision (visible and thermal), sound and measurement of ambient conditions. The ChickenBoy is a win-win-win solution. The win for farmers is better information and cost savings, the win for chickens is earlier identified needs and resulting better health and welfare and the win for consumers is peace of mind and reduced antibiotic load.



Farm Automation and Robotics SL (Faromatics) was founded in June 2016 after 18 months of private market evaluation. Our founders – with extensive experience in successful start-ups, instrumentation, animal health and welfare and value creation in Precision Livestock Farming (PLF) – have identified this business opportunity and funded the building of the first ChickenBoy prototype. The ChickenBoy prototype has been successfully deployed to commercial farms in Spain and the United Kingdom since November 2016.

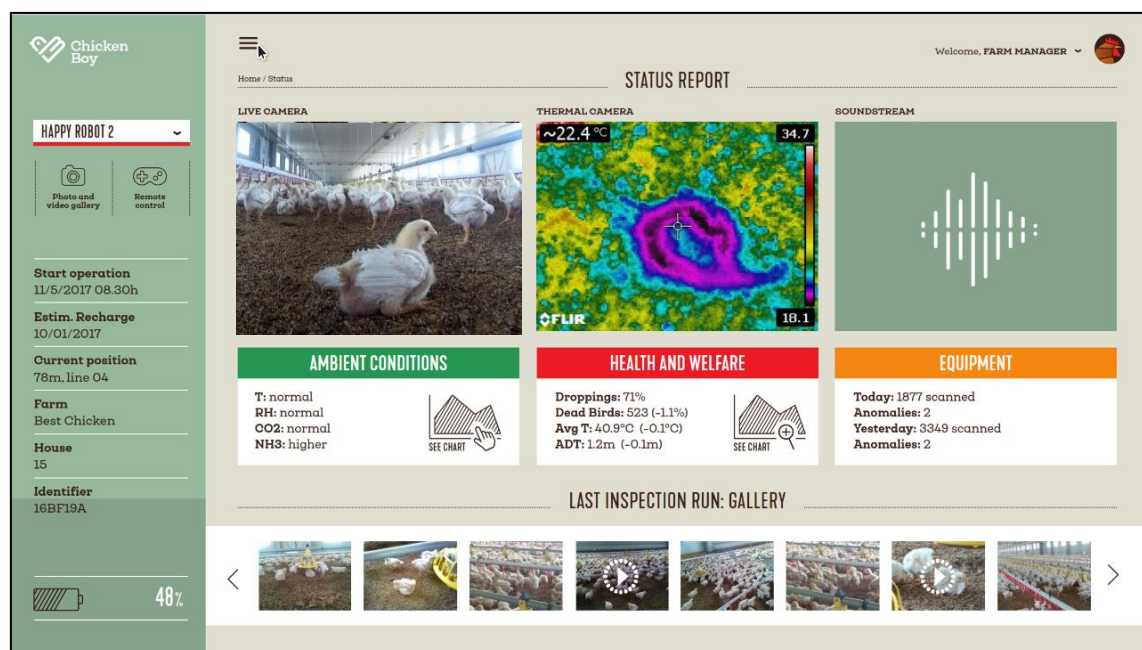
There are over **100,000 chicken production units world-wide**, producing about 25 billion broiler chickens per year. World meat consumption, according to OECD and FAO projections, is

¹ [http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/epw15188/\\$FILE/Goddard-Tom.pdf](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/epw15188/$FILE/Goddard-Tom.pdf)

expected to average 36.3kg in retail weight by 2023, an increase of 2.4kg compared with 2013. Some 72% of the increased consumption will come from poultry², equivalent to a 1.3% annual growth in poultry meat consumption. We expect to be able to take a 25% market share in the first three years when we will see penetration of robotic broiler solutions increase from 0-4%. We estimate our total serviceable available market to be 1,400 robots/year.

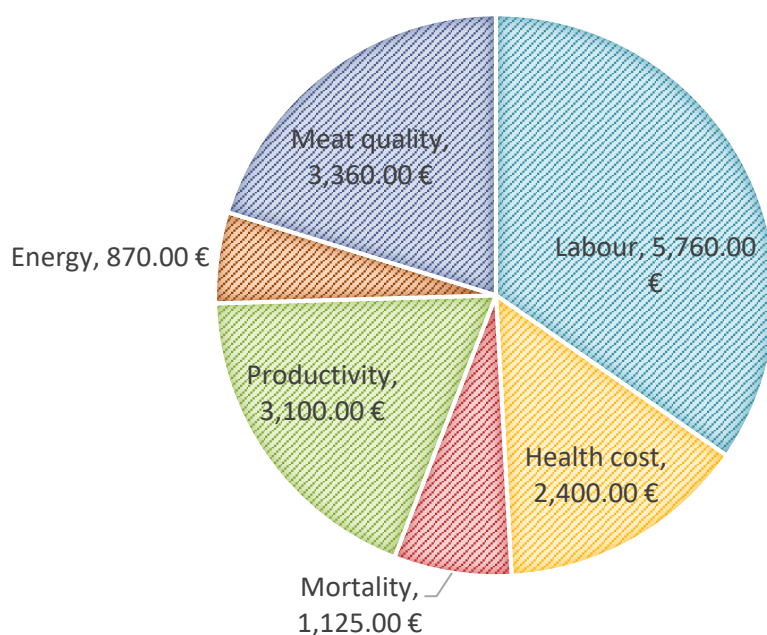
There is clear market interest for smart robotic solutions. For a recent proposal to an innovation project under the Horizon 2020 programme of the European Commission, we were able to obtain Letters of Interest from prospects representing more than 250m birds and an annual 30m€ revenue opportunity for Faromatics. In addition, several other solutions have recently emerged. However, none of the direct competitors are ready for market entry. The **Octopus Scarifier de Octopus Robots** (France) has started commercialization at the end of 2017/beginning of 2018. This robot is much larger than ChickenBoy. As additional functionalities it aerates the litter and provides a nebulizer. However, it does not incorporate the recognition of dead birds, the detection of malfunction of equipment or the quality of the digestion of the chickens. Its price ranges from € 35,000 to € 50,000 depending on the configuration requested. The **Spoutnic by Tibot Technologies** (France) only "moves" the herd. Its main use is for breeding hens so they do not lay eggs outside the nests. Its only functionality is movement of the flock. Price: € 7,990. Commercialisation started in September 2017. In addition, there are the Poultry Bot of Livestock Robotics (Netherlands) and GOHBot of Georgia Tech Research Institute (USA) which are still under development and may or not be commercialized.

Our **business model** is based on unit sales of the final ChickenBoy robot and accessories in addition to services. The unit price of the robot will vary according to accessories and version between 9,995-14,995€. The payback period is less than a year due to labour savings, reduced mortality, lower health costs and better welfare.



² <http://www.thepoultrysite.com/articles/3324/global-poultry-trends-2014-growth-in-chicken-consumption-in-america-slows/>

ANNUAL SAVINGS PER ROBOT



The above chart details the annual savings for a typical chicken house. The total cost of ownership per year including installation is 1,924€. In a 5 year period, the farmer will save a total of 68,406€ per house.

Our additional services will cost 99€/149€ per month. We expect direct services to provide 20% of the revenue.

Investment is required to drive large-scale market uptake. To achieve that, we need to add specific functionality, such as a robotic arm, enhance our algorithms, add specific sensors such as a reliable ammonia sensor and enable the integration of third party extensions. For improvements, we are using an iterative approach in a co-creation process with farmers, integrators, vets and others.

Launching ChickenBoy will bring major economic and societal benefits. The main economic benefits include labour savings, increase in quality, early disease detection (which includes coccidiosis and possibly avian flu) and the retention of the social license to operate. The societal benefits of ChickenBoy are its contribution to animal welfare and health, social, environmental and economic sustainability.

3 The founding team



Farm Automation and Robotics SL (“Faromatics”) was founded in June 2016 after a period of about 18 months of discrete market evaluation. Faromatics was founded by a high-powered group of business people and experts. The founders are (see details below detailed):

- **Dr Heiner Lehr**, an entrepreneur expert in Precision Livestock Farming and coordinator/leader in relevant European research projects
- **Prof Dr. Dr. h.c. Jörg Hartung**, Prof emeritus of the Stiftung Tierärztliche Hochschule Hannover (Germany), world-renown expert in animal health and welfare
- **Daniel Rosés**, expert in sales of precision instruments
- MSc (Eng) **Johan van den Bossche** and MSc (Eng) **Maurice Mergeay**, serial entrepreneurs and successful coaches of over 120 high-tech start-ups, with a survival rate of 90%

The spark to found Faromatics came when experts in animal health and precision livestock farming came together in a EU funded research project and identified two main shortcomings of PLF: the difficulty to measure at animal level and the need for a platform to easily deploy new sensors in real commercial farms. In addition, the founders had the opportunity to start 5 company as part of the project, and found that there is a clearly an opportunity for high-tech start-ups with a clear value proposition.

After start-up, the company contracted two technicians, Oscar Enento, an electronics expert with 25 years of work experience and a young master student, Albert García, with robotics background, deep knowledge in robot programming and doing a master thesis in autonomous wheelchairs, Júlia Llanas, a mechanical engineer with practical industry experience and George Ewah-Uche, a talented software engineer.

The company is held partly by private persons and partly by a business angel with the following shareholdings:

- Heiner Lehr, CEO, 43.32%
- Johan van der Bossche, Maurice Mergeay, Daniel Rosés and Jörg Hartung: 10.83% each
- Dagda Ventures BVBA, 13.37%

Dr. Heiner Lehr, expert in Precision Livestock Farming



Dr rer nat Heiner Lehr (summa cum laude) has a long career in software innovation, specializing in consulting and development of large-scale international projects.

He has worked for a large variety of companies, including media giant Bertelsmann AG. Before turning his attention to food production, he was a pioneer in interactive television and led prestigious projects in the area of supply chain management.

Heiner is a recognised expert in Precision Livestock Farming and traceability, having led the path-breaking project BrightAnimal and ALL-SMART-PIGS, as well as being work package leader in EU-PLF and board member of BioBusiness.

Heiner is also an entrepreneur, having co-founded Syntesa Partners and Associates in 2012 and INKUBIK in 2013.

Heiner works with seven UN agencies and the EU Commission on improving the competitiveness of the primary sector and has developed software solutions for the livestock management, the Halal sector, the palm oil and many other sectors. Heiner lives near Barcelona, Spain.

Prof Dr. Dr. h.c. Jörg Hartung, Agricultural Advisor



Professor Dr. Dr. h.c. Jörg Hartung, former Director (1993-2013) of the Institute for Animal Hygiene, Welfare and Farm Animal Behaviour, University of Veterinary Medicine Hannover, Foundation, Germany.

Jörg is a veterinarian and professor emeritus for Animal Hygiene and Husbandry and Animal Welfare Science. Honorary Doctor of SLU, Sweden.

Thirty-five years teaching veterinary students and researching in national and supra-national projects on animal health, welfare, behaviour, hygiene, bio-aerosols, air quality measurement and husbandry of food delivering animals, environmental protection and occupational health aspects in modern livestock production. Six years vice-chair (2006-2012) of Scientific Panel AHAW in EFSA. About 200 refereed publications. Jörg lives in Hannover, Germany.

Daniel Rosés, Sales and Marketing Advisor



Daniel is an entrepreneur and the founder and CEO of Abrox Tecnic S.L. Daniel has more than 30 years of experience in industrial activities related to accuracy measurements, quality assurance, as well as consultancy. He holds an executive MBA degree.

Daniel Rosés is the CEO of Abrox since 2000, a company specialized in optical measurement systems and solutions, such as vision based inspection systems, and dynamic position measurement solutions. An important market activity that Abrox has developed is sales and services of optical measurement systems.

Daniel was part of the SME Drive of the EU-PLF project and helped start five new companies in this function. Daniel lives in Barcelona, Spain.

Johan van den Bossche, Robotics Advisor



As a co-founder of Krypton Electronic Engineering, a spin-off from the University of Leuven (1989-2005), Johan gained experience as CEO of this company, on how to bring new technologies to a worldwide market.

Before being bought-out, Krypton El. Eng. was an important market player in the field of mobile coordinate measurement machines in the automotive sector, with Ferrari as a reference customer. Krypton had a major role in Schumacher's 2002 world cup victory, despite a dramatic start of the season.

Johan then founded SO Kwadraat, together with Maurice Mergeay. Through this organization, Johan coached more than 130 teams, of which 55 started their own high-tech spin-off company, resulting in more than 400 direct new jobs.

Johan was leader of the SME Drive of the EU-PLF project and helped start five new companies in this function. Johan lives in Leuven, Belgium.

Maurice Mergeay, Sales and Marketing Advisor



Maurice is a serial entrepreneur, a coach, a board member and a CEO. He graduated in mechanical engineering from the KULeuven in 1974, became a research assistant and started in 1979 his first company, LMS International.

At the time, the company was only the second spin-off of KULeuven and today remains one of the biggest. Maurice is active in different companies as business coach, board member or investor. Strategic and financial analysis, strategic management and strategy deployment are some of his important expertise.

Maurice then founded SO Kwadraat, together with Johan van den Bossche. Through this organization, Maurice coached more than 130 teams, of which 55 started their own high-tech spin-off company, resulting in more than 400 direct new jobs.

Maurice was part of the SME Drive of the EU-PLF project and helped start five new companies in this function. Maurice lives in Leuven, Belgium.

4 Concept

The ChickenBoy is an automated surveillance platform that moves autonomously through chicken houses and provides measurements of vital parameters at the level of chickens – where they really matter. The ChickenBoy is a tool for farmers to better manage their broiler flocks – as part of the animal and farm-centric approach of Precision Livestock Farming (PLF)³³. PLF is a balanced approach to livestock farming which tries to make livestock farming

- More acceptable – through mapping ambient conditions throughout the whole barn at chicken level, continuous observation, enrichment and early disease detection

³³ For a 3'-introduction see e.g. <https://youtu.be/0asSJYKFMVw>

- More practical – through remote surveillance at any time, automated equipment monitoring, assessment of digestion quality and – at a later stage - removal of dead birds

The ChickenBoy wishes to help identify needs of broilers quicker, such as good environmental conditions and on-coming illness. It also wishes to assist farmers in managing more efficiently large numbers of chicken houses by (a) management by exception, (b) automation of routine tasks, (c) efficient resource use (feed, water), (d) avoidance of illness and welfare issues leading to illness. For all these purposes a platform that can monitor conditions at the level of broilers 24x7 is ideal. The ChickenBoy will satisfy the needs as detailed in Table 1.

Table 1 Identified needs and how ChickenBoy will address them

Area	Need	Satisfaction through
Health	Measurement of key indicators <u>at chicken level</u>	Robotic measurement base with temperature, humidity, CO ₂ , NH ₃ , litter moisture with four extension slots for additional instruments, developed by 3 rd parties
	Early disease warning	Identification of body temperature increases of broilers Identification of gastro-intestinal issues from droppings
Welfare	Better monitoring of real conditions	Through streaming of thermal imagery, video and audio, farmers can monitor chickens remotely 24x7 Cloud-based remote user interface can be accessed by vet remotely for monitoring of health and welfare issues
	(Partial) automation of welfare assessments	Measurements of key welfare indicators related to 4 freedoms: <ul style="list-style-type: none"> • <i>Freedom from hunger or thirst</i> by identifying equipment failure • <i>Freedom from discomfort</i> by measuring ambient conditions • <i>Freedom from pain, injury or disease</i> by early disease detection and identification of chicken mobility • <i>Freedom to express (most) normal behaviour</i> [for future releases of the robot] • Freedom from fear and distress by using the Avoidance Distance Test and stress monitoring
Productivity	Efficient resource use	Measurement of good digestion Identification of equipment problems
	Labour savings through automation of routine tasks	Automated routine inspection of equipment and installation with recording of media (sound, photo, video) for later revision Enabling “management by exception” through early warning messages directly to the farmers’ smartphone or smartwatch

The payback period is estimated to be less than one year. This is achieved by reducing labour costs, detecting equipment failures and provide early warnings for welfare and health issues.

In addition to the easily monetisable contributions of the ChickenBoy, the robot will also increase the control of farmers and farmer managers over their flocks, increase the quality of production and the social acceptability of broiler farming through demonstrably better animal welfare. The robot will also decrease the dependence on experienced stock persons which are increasingly difficult to get.

The main monetizable benefits for users of are:

- Labour savings, estimated to be >1h per day
- Early disease detection reducing medicament costs and mortality,
- Increase in productivity due to better living conditions

The ChickenBoy has been designed with the following selling points in mind:

- Measurement of welfare, health and productivity key performance indicators at chicken level

- Increased quality and labour savings through automation of routine tasks
- Connect live to your broilers whenever, wherever and listen, see or “smell” in
- Steer the robot remotely to where you want or let it roam on freely configurable paths
- Return on Investment 1 year or less

The combination of opening new management possibilities to farmers by measuring the environment remotely and at the level of the chickens in combination with a very reasonable payback period, make a very sound proposal to the market.

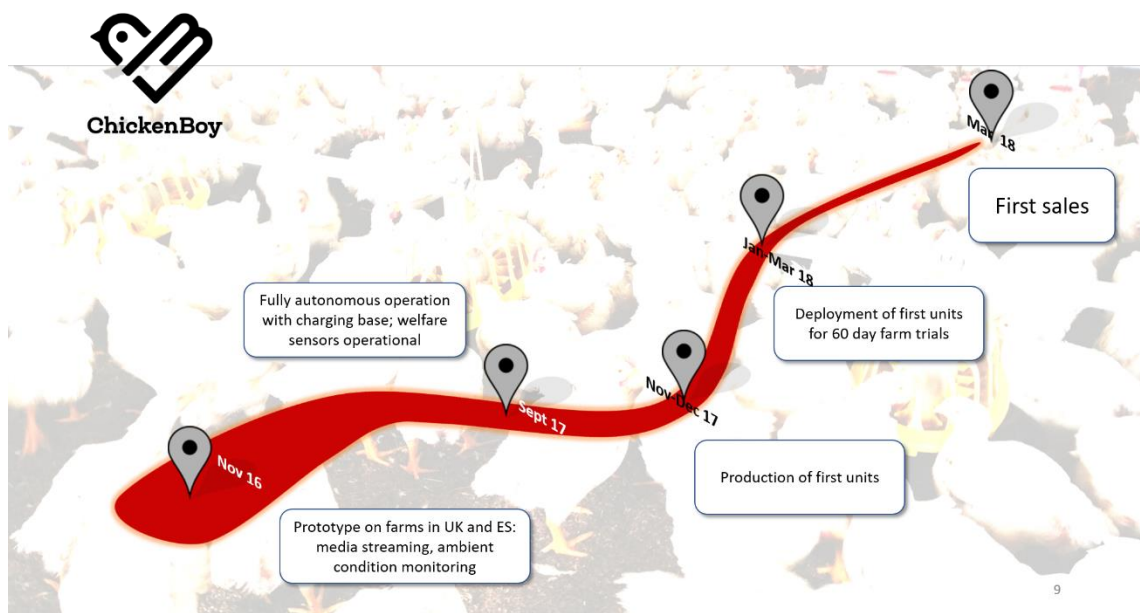
The base price for the ChickenBoy is 9,995€ with several extensions being available. The base price for the ChickenBoy with fully automated removal of dead chickens is currently envisaged to be 14,995€.

The ChickenBoy in detail:

- No-collision, automated chicken surveillance
- Programmable paths and automatic re-charge
- 3 degrees of freedom (x,y,z)
- Cameras (3 visible, 2 thermal) + sound (in/out)
- Ambient conditions (T, RH, CO₂, air speed)
- Early detection of health anomalies
- Identification of dead birds
- Detection of equipment anomalies
- 4 extension slots for instruments
- Cloud user interface with video/audio streaming

5 Status of development

As of January 2018, the development of the ChickenBoy is completed. During 2016/2017 we validated the performance in real environments (commercial poultry farms in Spain and the UK) in order to understand the reliability and robustness of the product and test the reaction of live birds to it throughout their life cycle. After receiving market feedback from producers, we decided to abandon the floor-based model and hang the robot from the ceiling. This configuration has the advantage of not sharing space with the chickens and therefore being apt also for great bird densities. Both hardware and software of the ChickenBoy are designed specifically to cope with the complexities and dynamics of poultry houses. These dynamics include (but not limited to) not-universal structure and architecture of the houses, presence of live fast-growing animals, and different lighting conditions.



Completed Feasibility Study and Business Plan

We have already completed a **self-financed feasibility analysis** prior to developing our robot. Here is a summary of the outcome:

1. **Technological viability.** In a series of collaborative research projects, essential key performance indicators were identified. Base data for most KPIs can be captured with existing technology, but algorithms need to be developed for early warnings of critical situations; some 3rd party sensor development is also necessary for early disease and welfare diagnostic.
2. **Market research.** The business canvas, user needs assessment, market analysis including size, growth, competitor and substitute analysis has been completed. Relevant business analyses (PEST analysis and Porter five forces) have been done. Market segmentation has resulted in a number of target client segments. A first socio-economic benefit analysis has been performed.
3. **Pricing model evaluation.** The feasibility study indicates that our business model is based on the sales of ChickenBoy robots and additional services; a basic robot will be priced at 9,995€ with a return of investment (ROI) time of under 12 months; a robot with mechanical capabilities will be sold for 14,995€ with a similar ROI time. The farm needs to use one ChickenBoy per chicken house; a ChickenBoy cannot be used in more than one house due to biosecurity considerations. We have collected several Letters of Interest by stakeholders, the producers of which represent a combined 250m birds per year.
4. **Risk analysis.** We have thoroughly analysed the risks for the company and created an exhaustive risk register; the main risks are listed in section 14.
5. **IPR analysis.** We already have filed a first patent (PCT/EP2017/068433) in August 2017. However, we need to continue strengthening our IPR to ensure that we have a competitive edge over new entrants.
6. **Business, Financial and Scaling Plan.** Our business plan is operational since 01/01/2017. This business plan includes a detailed financial plan, commercialization roadmap and production scaling plan.

Product roadmap (2017-2020), with focus on automation in chicken industry

- 2017: development of ChickenBoy, our broiler surveillance solution
- 2018: development of ChickenBoy+, with additional mechanical device for removal of dead chickens
- 2019: development of ChickenDad, our solution for parent stock with induced herd movement, collection of stray egg and automated gait score determination
- 2020: development of ChickenMom, our solution for laying hens with multi-level surveillance, collection of stray eggs and improved welfare indicators

Post 2020, Faromatics will apply its technology to other production systems, in particular pigs and cows.

6 Market opportunities

There are more than 100.000 chicken production units world-wide producing about 30 billion broiler chickens per year. Faromatics believes it can capture at least 2% of the world-wide market, resulting in the need for about 2.000 robots; with a lifetime of 4-5 years for a robot, this results in a yearly need of about 400-500 robots. The main markets are initially the European Union, the United States and Australia, because of their high labour cost and technological approach to livestock farming. China and Brazil, other key markets, will be accessed after some consolidation in the aforementioned areas when we expect that Precision Livestock Farming has firmly established itself in these countries⁴.

World meat consumption, according to OECD and FAO projections is expected to average 36.3kg in retail weight by 2023, an increase of 2.4kg compared with 2013. Some 72% of the increased consumption will come from poultry⁵, equivalent to a 1.3% annual growth in poultry meat consumption. Given that this will propel more farms into a size that requires automation and because of the general progress in farm technology we expect that the growth in demand of the ChickenBoy outperforms this mature market at least for the next 10-20 years.

Our initial target market clearly is Europe and within Europe those countries with highest labour costs. The 10 largest producers of chicken meat in Europe – depicted in Figure 1 – fall into three categories: (i) non-EU member countries (Turkey, 1st), (ii) lower labour cost countries (Poland, 3rd; Hungary 9th, Romania 10th) and (iii) high labour cost countries (France 2nd, United Kingdom 4th, Germany 5th, Spain 6th, Italy 7th and Belgium 8th).

Our initial target will be category iii and in particular **France, United Kingdom, Germany and Spain with a combined 51.4% of production** among the top 10 producers. This choice is motivated by the fact that the team of Faromatics has significant contacts in the target countries and speaks all four national languages.

Of course, Faromatics has the typical market access risks that any start-up has. The market barriers we currently perceive are collected below. The most important barriers we can currently perceive are related to Intellectual Property Rights and the question how efficiently they protect our invention in the world-wide market, in particular in countries where traditionally patents don't lend much protection. Equally, alternative products might be able to "ride the wave" and compromise our market position by providing e.g. a cheaper solution; in an extreme case, there is a risk that cheap, malfunctioning solutions could give broiler robots a bad reputation. An equally important barrier could be that animal welfare/animal rights groups don't accept using robotic solutions on broiler farms as further "industrialisation". A "ban" by such organisations could be a very serious market barrier in Europe where such organisations are strongest.



Figure 1 10 largest broiler meat producing countries in Europe 2010-2015. Darker colour indicates higher average production (Src EUROSTAT)

⁴ The First Asian Precision Livestock Farming conference was celebrated in Sept 2016 in Beijing, China

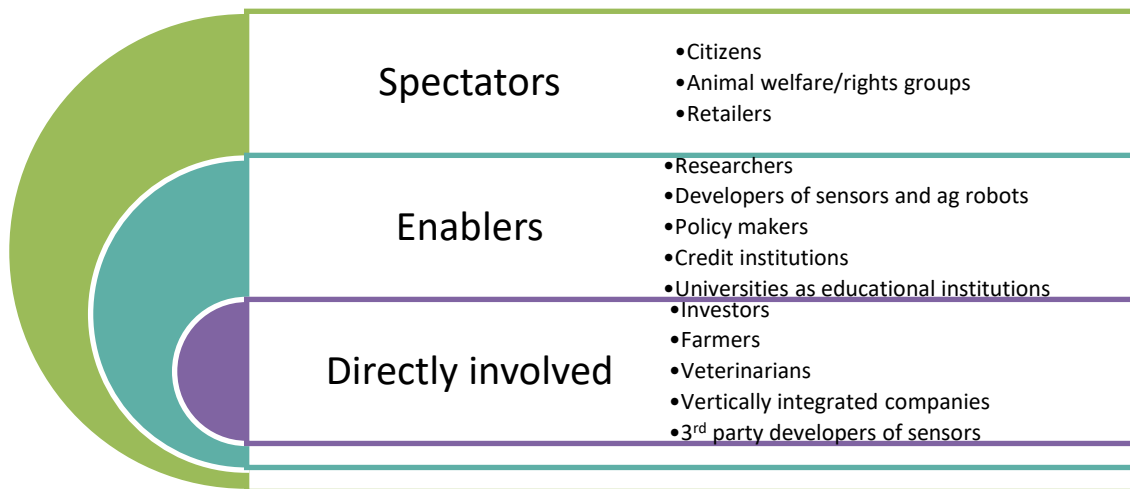
⁵ <http://www.thepoultrysite.com/articles/3324/global-poultry-trends-2014-growth-in-chicken-consumption-in-americas-slows/>

Area	Market barrier	Mitigation strategy
Competition	Alternative products might be brought onto the market on the back of the success of the ChickenBoy	Faromatics aims to stay ahead of the curve by continuing its innovation strategy. The innovation strategy is strengthened (i) by our close relationship to science through the involvement in the Precision Livestock Farming sector and (ii) very close working relationship with farmers
IP protection	Innovation protection not sufficient leading to copycats	Faromatics has secured the ChickenBoy through European patent application 16180415.8-1655. A global patent is outstanding; we will strengthen our protection of intellectual property by means of industrial secrets. Algorithms developed and the database of droppings are assets that hinder simple copying.
Animal welfare groups	Pushback from animal welfare and animal rights groups	It will be one of the tasks in the area of communication to establish a working relationship with leading European animal welfare and rights organisations to convince them that the ChickenBoy allows greater animal welfare improvements. We will try to convince an animal welfare organisation and a farmer on a shared pilot to showcase how the ChickenBoy can lead to greater transparency and ultimately better welfare.
Reputation	A Spanish high-tech product might not be trusted in target markets	Spain has little history of creating high-tech products; however, if we find that this has a negative impact on our market access, it is relatively easy to establish a branch or even move the company e.g. to Denmark or Belgium where founding members already have an established presence.
Market shrinks	Broiler production moving to low labour cost countries	Over time, with the falling cost of components and higher production numbers, we will create a product line with a similarly short Return on Investment timeline for developing countries, in particular Brazil and China.
Farm economics	Financially difficult situation for broiler farmers	The current Return of Investment is estimated to be about 1 year when most equipment has much larger ROI periods. With such an excellent proposal, our growth would probably be slowed in the case of a financially disadvantageous situation of broiler farmers, but not stopped.
Technology fails	The ChickenBoy might not have the right functionalities, work reliably or require too much maintenance	The founding members have been involved with PLF and farmers for more than 8 years and have developed a list of key indicators together with farmers from all over Europe. In addition, the team has been working with two innovative farmers in Spain and the UK to identify key functionalities the robot must have. In about 6 months, the engineering team of Faromatics has been able to create a proof-of-concept prototype that was tested successfully on farm. We are quite convinced that the team has the right set of qualities to produce a commercial robotic solution. If the robot requires too much maintenance, Faromatics will adapt its go-to-market strategy and provide the robot first in two European countries where we set up a support organisation with the view to partner with distributors that already provide such support to farmers; this will reduce somewhat our profitability, but not stop the company from selling.

Other barriers to market could be a strenuous financial situation of farmers leading to very low (technology) investment levels, a general move of the broiler industry to low labour cost countries (where the ROI period of the ChickenBoy is higher and the use of technology less widespread). Finally, our solution could in principle not be apt for the market we target.

A more detailed discussion of the investment risk can be found in Section 14.

7 Stakeholder analysis



Primary stakeholders, i.e. those directly involved in the commercial success of Faromatics, are in particular **target clients**, i.e. farmers that buy the ChickenBoy to help on their farms, vets that buy/recommend buying to monitor bird health and vertically integrated companies that wish to increase their level of control over outsourced farming operations. **Investors** are also essential to fund the steps required toward commercial success. For the longer run, we believe that **3rd party developers** of sensors are essential for our commercial success to extend the functionalities of the robot and make it more attractive (in a similar way as 3rd party apps make mobile phones more attractive to buy).

Enablers are those stakeholders that provide a favourable environment for the company. Here we need further research and development by private and public research organisations. Universities double up as providers of well-trained engineers that we will need. Credit institutions will be needed to help with the cash flow management. Finally, policy makers might have a great positive impact if remote sensing solutions were to be considered equal to the legally required physical inspection of chicken houses.

Finally, **spectators** are those that sit in the background, but can still have a very significant impact on the success of the company. **Citizens**, primarily through their representatives, i.e. **animal welfare/rights groups** and **retailers** can provide the social license to operate for the ChickenBoy. A withdrawal of that license would pose a significant threat to our ambitions.

Market segment analysis

The ChickenBoy provides a clear value proposition and “intelligent” solutions to farmers, rather than just measurement of data. As a result from the European research project [EU-PLF](#), we have developed a list of key indicators for broilers together with the farmers. The ChickenBoy was developed to address the top indicators.




While our primary target clients are farmers (and indirectly chickens), the robot also provides quite interesting applications for vets and consultants, production managers in vertically integrated operations and researchers. Official controls are another market application, but we currently see it as secondary market and don’t expect to target this market other than through vets in the timeframe of 2017-2022.

The result of the market segment analysis is summarised below:

Client	Market application	Need	Impact/performance
Farmers	Automated poultry surveillance	Early disease identification Continuous welfare assessment Automated monitoring of equipment Removal of dead birds	Streaming of audio/video Labour savings of 1h/d/house Disease warning 24h earlier Identification of 80% of equipment failures 80% removal of dead birds
Vets and consultants	Remote health assessment and surveillance	Remote connection to house Early disease identification Continuous welfare assessment	Streaming of audio/video Reduction in number of visits Quicker service through disease warnings
Integrators	Better farm operation assessment	Measurement of KPIs Remote connection	Much greater insight in farm operation Farm benchmarking Visual review/status
Researchers	Platform for animal-centric PLF sensors and solutions	Extensible on-farm platform for measurement and experiments Access to farm data	Easy deployable platform apt for operation in commercial farms Cost-efficient deployment on farms Add-on to existing robots possible

8 Competitive analysis

Robotics in Precision Livestock Farming is relatively new. A review of technology solutions at EU-ROTIER 2016 and SPACE 2017 has shown that in poultry, technology is mostly used in hatcheries and to some extent in laying hens. For broilers, very little technology is used apart from ventilation and the FANCOM Eynamic system.

			
	ChickenBoy	Octopus	Spoutnic
Purpose	Welfare + Productivity	Decontamination	Herd movement
Type	Hanging	Ground-based	Ground-based
USP	KPIs, extensible	Disinfection, aeration	Stray eggs, lameness
Application	Broiler	Broiler	Parent stocks
Unit price	9,995€	45-60,000€	7,000€

The **Octopus Scarifier de Octopus Robots** (France) will start to be commercialized at the end of the year/beginning of 2018. This robot is much larger than ChickenBoy. As additional functionalities it aereates the litter and provides a nebulizer. However, it does not incorporate the recognition of dead birds, the detection of malfunction of equipment or the quality of the digestion of the chickens. Its price ranges from € 35,000 to € 50,000 depending on the configuration requested. The **Spoutnic by Tibot Technologies** (France) only "moves" the herd. Its main use is for breeding hens so they do not lay eggs outside the nests. Its only functionality is movement of the flock. Price: € 7,990. Commercialisation started in September 2017. In addition, there are the PoultryBot of Livestock Robotics (Netherlands) and GOHBot of Georgia Tech Research Institute (USA) which are still under development and may or not be commercialized. A recent paper⁶ from Australia describes an early-stage robot to measure air quality, but is still struggling with the basic robotic movement.

One of the key results of EU-PLF was that farmers need clear value propositions and "intelligent" solutions, rather than just measurement data. The project has developed together with farmers key indicators for broilers; litter aeration – while an extended practice – and disinfection did not make it to that list. The ChickenBoy on the other hand was developed to address a number of top indicators.

⁶ <https://ijabe.org/index.php/ijabe/article/view/1189>

We are very confident therefore that the ChickenBoy will add direct and measurable value to farmers. In fact, a one hour labour saving per day alone will provide a return on investment of about 1 year, even without the robot having provided early disease warnings.

9 Commercial strategy

A high-level commercialisation strategy is depicted above. We plan to commercialise the ChickenBoy in three distinct phases:

In the **prototype phase**, we were working with farmers in Spain and United Kingdom to test the robot. This phase is now concluded.

In the **pre-commercial phase**, we are selling the first version of the ChickenBoy to paying customers to build up sales expertise, gain experience on sales and after-sales and obtain market feedback on pricing and functionality. The first 10 customers receive a 30% discount in exchange for marketing opportunities and data from their farms. **4 installations are now being undertaken** in Spain, Netherlands and United Kingdom and we hope to add more very shortly. **The pre-commercial phase will end in March 2018.**

In the **commercial phase** – that we will start in April 2018 – the fully commercially viable version of the robot will be offered globally through (i) word-of-mouth marketing from the earlier developed user base, (ii) dissemination on Precision Livestock Farming conferences, (iii) presence on trade fairs and (iv) publications in relevant sector journals or mainstream media. Geographically, we will concentrate on Europe first, adding in particular France, Belgium, Germany, Poland, Hungary and Romania to the list of countries addressed in the pre-commercial phase. In the second half of 2019, we will start building networks in North-America, China and Brazil. We expect commercialisation of our robot in the USA in 2020; sales in China and Brazil will start mid-2020. We expect to sell in these countries through partners/distributors with an established local presence and significant existing networks. If these partnerships are successful and profitable, we can foresee expanding them into the European core area, so that Faromatics can concentrate on the more profitable activities of research, development and innovation.

Distribution and sales strategy

Faromatics will scale up its operation to directly service the European market. Our starting point will be word-of-mouth from early adopter farmers through their social networks. We have examined very closely sales efforts of PLF start-ups and have found this to be the most promising sales strategy. Partnering with large distributors will be a necessity when we access overseas markets, such as China, Brazil and the USA. We already have an excellent relationship with the leading agtech companies, [Fancom](#). Fancom is a global company, owned by Warren Buffett's Berkshire Hathaway Inc. However, this will not exclude us working with the market leader in poultry technology, Big Dutchman, to whom we have connections through our board member Prof. Dr. Hartung.

10 Marketing strategy



The main communication means are summarised above in function of the main stakeholder groups we have identified.

We will reach **clients and prospective clients** primarily through networks of our early adopters and word-of-mouth. Word-of-mouth marketing will be supported by a modern website and social networks (in particular LinkedIn and Twitter). Some of our early adopters have access to WhatsApp groups of farmers in Spain and the United Kingdom that will allow us to make calls for other early adopters and clients. We expect to visit clients individually in the early stages (2017-2018) to showcase the ChickenBoy; we also plan to participate in three trade fairs:

#	Name	When	Where
1	SPACE	Sept 12-15, 2017	Rennes, France
2	EUROTIER 2018	Nov 2018	Hannover, Germany
3	VIV Turkey or Asia ⁷	2019	Istanbul (Turkey) or Bangkok (Thailand)

On EUROTIER and VIV we will have a fully commercial booth.

In the future, Faromatics will also hold annual user conferences in February at a central location, e.g. Amsterdam airport. User conferences have the purpose to (a) receive feedback from actual users, (b) facilitate networking amongst users that will help our word-of-mouth marketing strategy, (c) showcase new developments and announce release plans. The aim will be to invite 50% of actual users, 30% of prospective users and 20% of other stakeholders. There will be one dedicated session for animal welfare/rights groups and policy makers where we hope to disseminate our findings and successes in the area of improvement of animal welfare and have a discussion about the role of robots in modern livestock management. It is not foreseen that during the funding period participants will pay for attending the conference.

For communication to **science and policy makers** we will mainly employ participation in scientific conferences and publication of academic papers. We aim to participate during the funding period in three scientific conferences, one of which will be in Europe (ECPLF 2019) and the others

⁷ Dates and location not yet known.

in China and Brazil, respectively. Participation in a conference in China will allow us to get an impression how open the market is for a robotic solution from outside of China. We expect that China is a much quicker market than Brazil, which is why we will attempt to do the same in the latter country only in 2019. Participation in the ECPLF conference in 2017 has allowed us to present our findings to the target group of researchers and developers of sensors and potentially capture 3rd party developers of new hardware to extend the robot's capabilities. It has also allowed us to identify relevant frontline research for possible collaboration with Faromatics.

#	Name	When	Where
1	EC-PLF 2018	2018	Europe
2	World Congress in Agriculture	2018	China
3	Not yet determined	2019	Brazil

We plan to publish three papers in the period of 2018-2019, partly as peer-reviewed journal publications, partly as conference proceedings. We believe it is well-invested effort, because (a) it will reach one of our target stakeholder groups, i.e. researchers and developers of PLF sensors and solutions, (b) it will allow us to remain within the sphere of influence of PLF and animal researcher with the possibility to participate in research projects, (c) for enablement of employees, in particular those with strong links to research and (d) means to sustain our reputation of a research-near, innovative company.

#	Topic	When	Type of journal
1	First results of field tests of robotic broiler farming	2018	Farm technology, such as J. Poultry Science and Technology, British/World Poultry Science, Agricultural Technology, J. Agricultural Science and Technology
2	Early health issues detection using artificial intelligence	2018	J. Animal Health, J. Vet. Med. And Animal Health
3	Socio-economic impact assessment of robotic broiler farming	2019	Farm economics, such as J. Farm Economics, J. Agric. Economics, Agric. And Food Econ.

The final stakeholder group we would like to reach through our communication programme in the funding period are animal welfare and rights groups. Our primary target will be those that have had already some exposure to Precision Livestock Farming, such as Compassion in World Farming (CIWF) and Vier Pfoten, or that operate important animal welfare certification systems or labels, such as the Deutsche Tierschutzbund ("Tierschutzlabel") or Plukon Food Group ("Fair-Mast"). We will reach these stakeholders by providing them with a space in our annual user conference to which also policy makers will be invited. In addition, we will directly lobby with such organisations through individual meetings where we will discuss the use of robots in intensive broiler farming and criteria for their acceptability.

We also foresee establishing direct communications with retailers, but at a later stage or through strategic collaborations, e.g. with the Institute of Productivity. Although retailers are somewhat removed from the farm operations, they are exposed to brand risks arising from animal welfare concerns. As was already developed in the EU-PLF project, a farm responsibility index – which is partly measured directly on farm – could help mitigate that risk. Retailers are important gateways to consumers and have a natural role in communicating the management of modern livestock farming to its clients. While we doubt that "robot controlled" chicken will be a consumer success, it is important for the long-term success of Faromatics that retailers and consumers buy into the concept of automated surveillance of broilers.

11 Protection of intellectual property

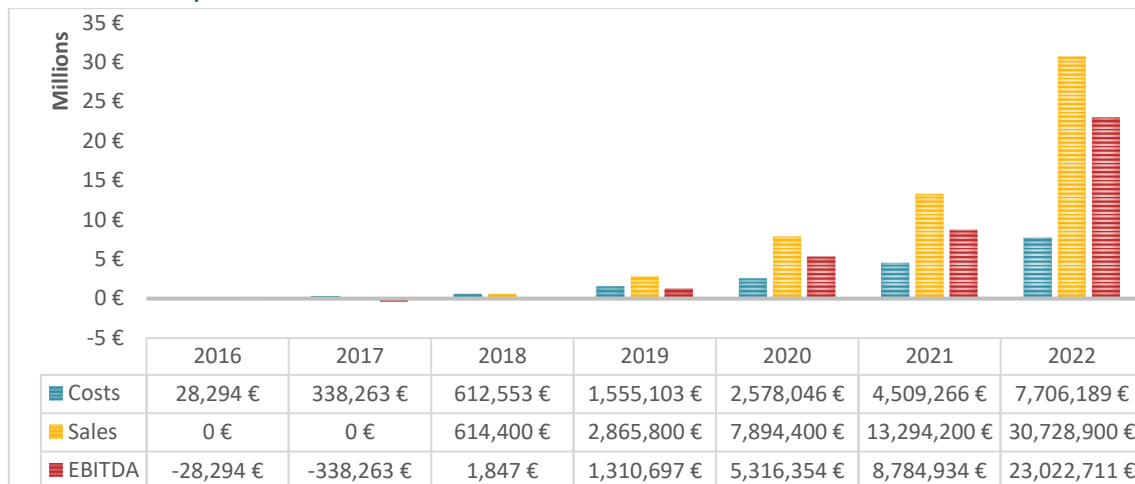
The founders of Faromatics have filed the European patent application PCT/EP2017/068433 on “ROBOT ASSISTED POULTRY SHED SURVEILLANCE”. The patent application describes “a robot surveillance system and method suitable for intensive meat production in animals such as poultry as well as to a robot for use in such a system or method.”

After research on disease detection, applications of the robotic arm and extension modules, we expect to file a new patent in 2018. Given the risk of copying that Faromatics is exposed to – in particular in markets where intellectual property is not generally respected – we will keep full ownership of patents. Employees of the company have and will continue to have clauses in their contracts that sign all Intellectual Property Rights (IPR) generated under employment over to the company.

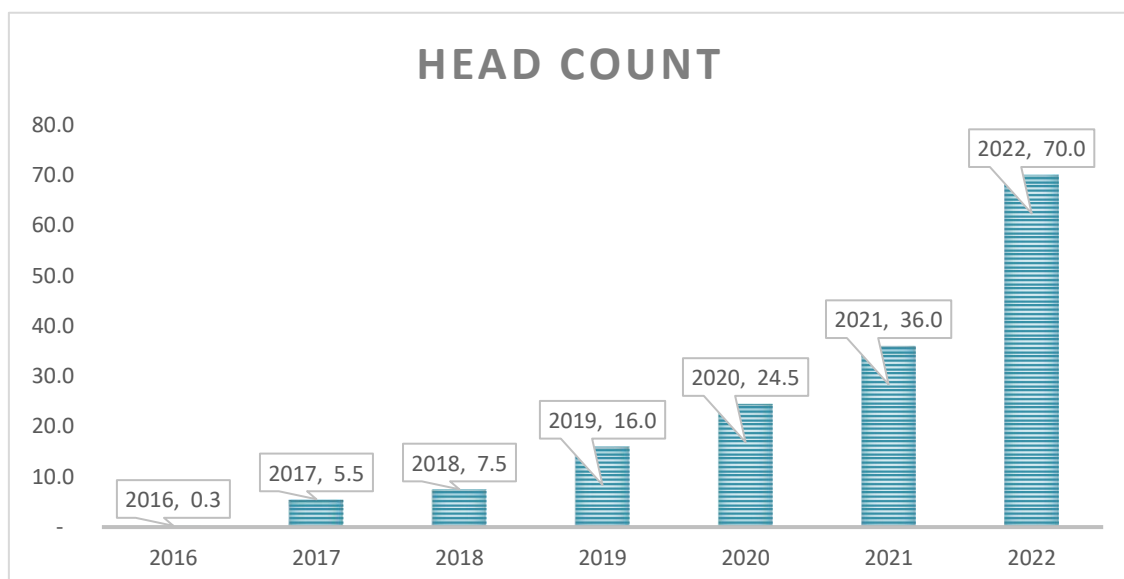
However, Faromatics also believes in the combination of patents (mainly to ensure the freedom to operate, i.e. to avoid that others file a patent that might compromise our marketing strategy) and industrial secrets. In particular the algorithms we expect to develop as well as the database of training images for digestion quality and illness detection will allow us to secure the functionality of our robot.

Faromatics is fully aware that only constant innovation will guarantee it continued leadership and is therefore building on the reputation of its founding members to engage actively in European research in PLF and robotics for livestock farming. Faromatics is currently preparing a proposal for an EU investment of 1.8m€ which would allow us to speed up the research and development by 2-3 years and put a comfortable distance between the current competitors and Faromatics. In addition, Faromatics is a likely partner in one more EU project proposal on poultry health issues. We will continue to actively engage with Leuven University, Wageningen University and Milan University to be part of their research proposals.

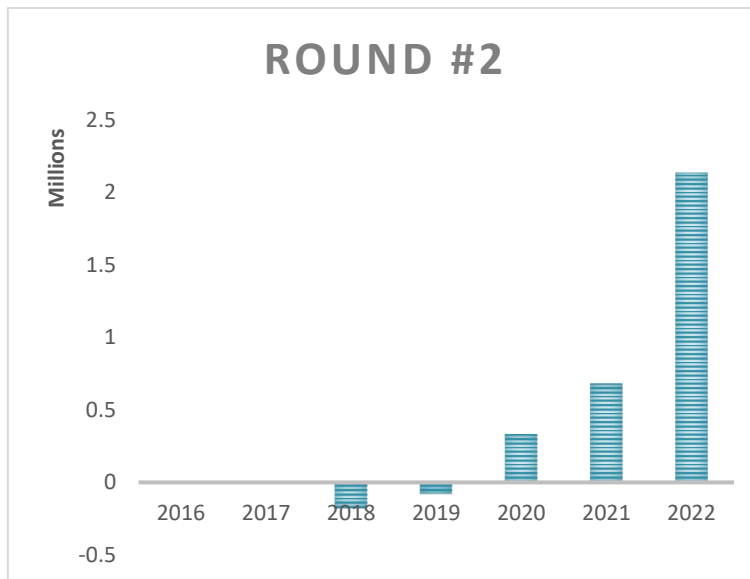
12 Summary of investment case



The figure above summarises the business plan of Faromatics over the full period of 2016-2022, including the inception phase of 2016. The investment project described herein is projected to cover March 2018-Dec 2019. This is the most vulnerable stage of the company on its way from innovation to market (the so-called “Death Valley of innovation”), where the go-to-market strategy is “warming up” and investment in technology development significantly outweighs sales.



In the period of 2017-2022, we hope to grow from **6 to 70 employees**, with a good mix of engineering, business development/sales and after sales support. Our human resource strategy foresees recruiting young engineers and technical personnel from Spain, where many fresh graduates currently have no other option than to emigrate. One of the local universities, the Universitat Politècnica de Catalunya with offices in the same building as Faromatics, has an own robotic research group and master course, from which we have already recruited successfully engineers for the proof-of-concept period.



With the ChickenBoy project, we estimate that Faromatics can reach **918 robot units per year** by 2022. Together with sales from 3rd party modules and service contracts, this will make Faromatics a quite profitable company. For the expected equity investment of 200,000€ we forecast a **return on investment of an annualised 56% in 2020 and 214% in 2022**, a very sound return for an investment with

limited risk. The company will have an EBIDTA of 23,0m€ at the end of 2022 thanks in part to its expansion into new markets, such as Brazil and China, and new product lines, such as robotic solutions for parent stocks and laying hens.

13 Use of the requested money

The requested working capital will be used in the following way:

Area	Item	Budgeted cost
Current	Marketing, R&D, business development and sales	254,000€
Fixed assets	Rental of facilities with potential purchase	194,000€
Reserves	Financing of late payments and unforeseen costs	52,000€
	TOTAL	500,000 €

The remaining budget required for 2018/2019 will be sourced from

- (i) Consultancy projects
- (ii) Pre-sales and sales (starting in Q2 2018)

Faromatics has been awarded a subsidy from the Catalan government STARTEC of the maximum amount under that programme of 77,000€. Founders have issued a participatory loan with a view of converting this into capital of 55,000€.

Of the current financing round therefore 132,000€ are already committed.

The company is currently talking to investors in Holland, Thailand and Brazil in addition to Belgium and Spain about further investments.

14 Investment risks

Area	#	Title	Mitigation strategy	Likelihood (L)	Impact (I)	Risk = L x I
Technological	1.1	Internet on farm not stable enough	In some countries like Spain satellite internet is becoming cheap (30-50€/month). In other cases, a local farm computer will digest the data and use master-slave synchronisation technology to update the central site whenever a connection becomes available.	4	2	8
	1.2	Robot requires more service than expected	We expect that service levels will be high for the initial 10 units. We expect to have a full person dedicated to after sales from Jan 2018 to resolve all issues, in addition to the engineering team. A professional tester will be employed to minimise the risk of product failure.	1	3	3
Human resources	2.1	Key personnel leave the company	Faromatics depends in its initial development phase (Q1 and Q2 2017) on key engineers and hopes to retain the current engineers at least throughout 2017-18. The current economic situation in Spain continues to be challenging and unemployment will be high at least until 2020. Since we are providing an attractive work place with good economic conditions in a small town with less opportunities, the risk is estimated to be low.	1	5	5
	2.2	Lack of availability of suitable personnel	The staff count of Faromatics will grow to 37 persons by 2022. Given the unemployment situation in Spain, the "sexiness" of the business and the presence of a local university with robotics research, it seems unlikely that we will not find suitable personnel. If personnel needs to be brought in from outside, Spain and the Barcelona area is very attractive for young people.	1	2	2
Financial	3.1	Investment insufficient to cover development in 2017	The budget for the period of 2017-2022 is very detailed. The first version of the ChickenBoy has been decided on a quite detailed basis and costs for its development are quite controlled. The confidence level of the budget is high, especially in 2017. However, should there be a funding gap, several alternative financing tools are immediately available.	3	3	9
	3.2	Underestimation of costs	Costs could in principle be much higher than projected. In order to mitigate that risk a 10% contingency has been added to the costs.	2	3	6
	3.3	Cashflow risk	As any company, Faromatics has a certain risk of exposure to cashflow problems. However, its founders have quite good relationships with banks. The economy in Spain is recovering, which should result in more credit being available for small and medium enterprises. Three of the founders of Faromatics also have other well-functioning businesses that might be able to assist. In extreme situations, in Spain it has become much easier to put workers on a short-term work scheme.	3	5	15

Commercial	4.1	Sales figures cannot be consolidated	<p>While sales figures are kept at very reasonable level, there remains a risk that the figures cannot be reached. From other high-tech companies, it is known that 200,000€ revenue per employee is a good standard; aggressive company attempt to reach 250,000€ per employee. Faromatics has decided to assume 200,000€ sales only after 3 years of commercialisation, providing enough time to the sales team to build itself up.</p> <p>Should the sales figures be somewhat overestimated, the company will continue to be profitable with about half the sales in 2019 and 2020. Its short-term return on investment would be compromised, but could be recovered by lengthening the time of investment. Corrective measures would be to switch to a distributor model, change the target client (e.g. from farmer to vet or to integrator) or the regional focus (changing from Europe to China or Brazil) or the go-to-market strategy (e.g. by selling the ChickenBoy through governments in developing nations looking to profile themselves.</p> <p>Should the sales figured be grossly overestimated, the company may not be viable would likely have to be taken off the market. Its knowledge and assets can likely be sold, but it is not clear at this stage whether the initial investment could be profitably recovered.</p>	3	5	15
	5.1	First movers have a generally higher risk of failure compared to first followers	There is a lot of debate in the start-up world whether it is more advantageous to be a first mover or a first follower. Faromatics can probably not be considered a first mover, since Octopus is already in the market, but in any case success cases for both exist on every level. It is clear that first movers can consolidate momentum by constant innovation only.	3	4	12
Competitive	5.2	Large-scale established competitor squeezes into the market	If a cash-rich, large scale company wished to enter the market, it could attempt squeeze us out e.g. by undercutting prices or by using its dominant position. In order to mitigate this risk, several strategies have been designed depending on the moment of occurrence.	2	5	10
	5.3	Intellectual property is not sufficiently secured	Faromatics has invested in IP protection and our plan foresees to add additional patents on a yearly basis. Faromatics believes in a combination of patents and industrial secrets for best protection.	4	3	12
Reputational	6.1	Animal welfare/rights groups might lobby to withdraw social license to operate of the ChickenBoy	There is a certain risk that robotic surveillance of broilers might be seen as compromising rather than increasing animal welfare. For this reason, Faromatics wishes to engage very early with groups that already have some experience with technology, such as Compassion in World Farming.	2	5	10