Smart Farming for Europe
*Value creation through **P**recision **L**ivestock **F**arming*

EU-PLF

Deliverable 6.1

Creation of the Blueprint

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1. A Validated Blueprint for innovation in the European livestock sector

The final activity of EU-PLF will consist in assembling a Validated Blueprint for innovation in the European livestock sector. The intention of the Blueprint is to inform new companies interested in the PLF industry how to go from an idea to an operational system at farm level. During the SME drive initiative of the EU-PLF project new PLF systems were identified which have the potential to be implemented at farm level. This EU-PLF Blueprint is therefore a manual for farmers, their surrounding industry including high tech Small and Middle-sized Enterprises and other stakeholders.

The aim is for the blueprint to be used as a reference tool offering pragmatic guidance on how Precision Livestock Farming (PLF) systems can be implemented at farm level in order to create value for the farmer and other stakeholders. It will analyse how Precision Livestock Farming technologies can create value at farm level by improving animal welfare, health, environmental load and productivity, extensive field tests are carried out by scientific and industrial partners in collaboration with high tech Small and Middle-size Enterprises. Moreover 20 farmers, spread over Europe, have used and experienced the technology and actively given feedback to help us develop this Blueprint. Highly experienced European teams from different disciplines with a proven track record in animal and Precision Livestock Farming-related fields - animal scientists, veterinarians, ethologists, bio-engineers, engineers, social scientists and economists, leading industrial market players in the livestock industry and high tech Small and Middle-sized Enterprises – have joined a consortium together with 20 farmers to deliver the EU-PLF Blueprint, a useful practical guide. The blueprint is made for all stakeholders related to PLF, representatives of the stakeholders (mainly stockpersons and related industry).

All the PLF stakeholders can use the blueprint, an example is that company can use it to transfer their developed prototype into an implementable system, make it operational on farm and prove that value is created at least on farm level. The blueprint highlights the business opportunities that result from EU-PLF. It leverages the economic and organizational research activities conducted during the course of EU-PLF, and is complemented by an in-depth market analysis that goes beyond the common knowledge of the state-of-the-art. The Blueprint is available to all consortium members and supports the confidential exploitation activities of individual stockpersons, industrial partners and SMEs. The Blueprint is now available through a website and can be used in an interactive way to support the PLF industry in Europe.

2. How to use the Blueprint?

Website Access and structure

To access the blueprint farmers and industry professionals must logon to the the e-course website, which is currently hosted by Agrocampus-Ouest in France. The URL of the e-course and blueprint website is: https://tice.agrocampus-ouest.fr/enrol/index.php?id=917. There you can request a login

credentials. Upon entering the blueprint portal the reader is first introduced to the structure of the blueprint, which is shown in Figure 1.
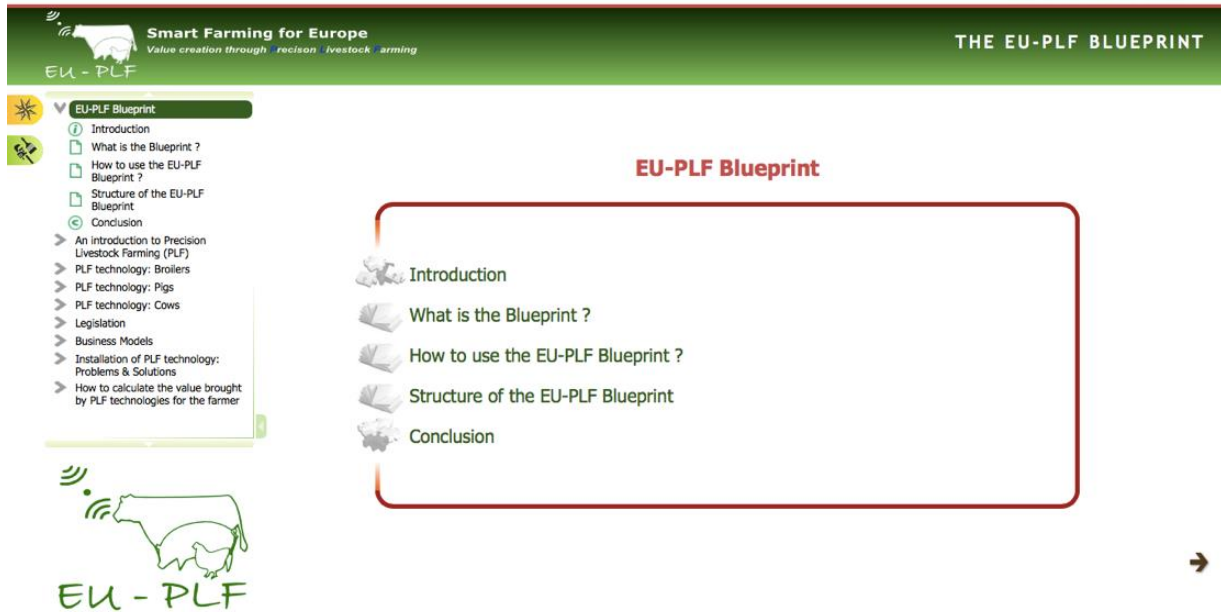

Figure 1. A screen shot of the blue print structure

In the introductory section the reader learns how to navigate the blueprint in an effective way. Figure 2 shows the individual paths that farmers/technology providers interested in diary, pig and broiler can take when navigating the blueprint. As we know that farmers and professionals have limited time to study this information we designed the blueprint to be read completely from start-to-finish in approximately 30 minutes. The typical division of this time across the different sections is shown in Figure 2. Of course, we acknowledge that some people would like further depth of understanding than what is available in the blueprint. For those this section includes a link to the Precision Livestock Farming e-course, which is a 8 hours course that covers PLF technology development and application more thoroughly.
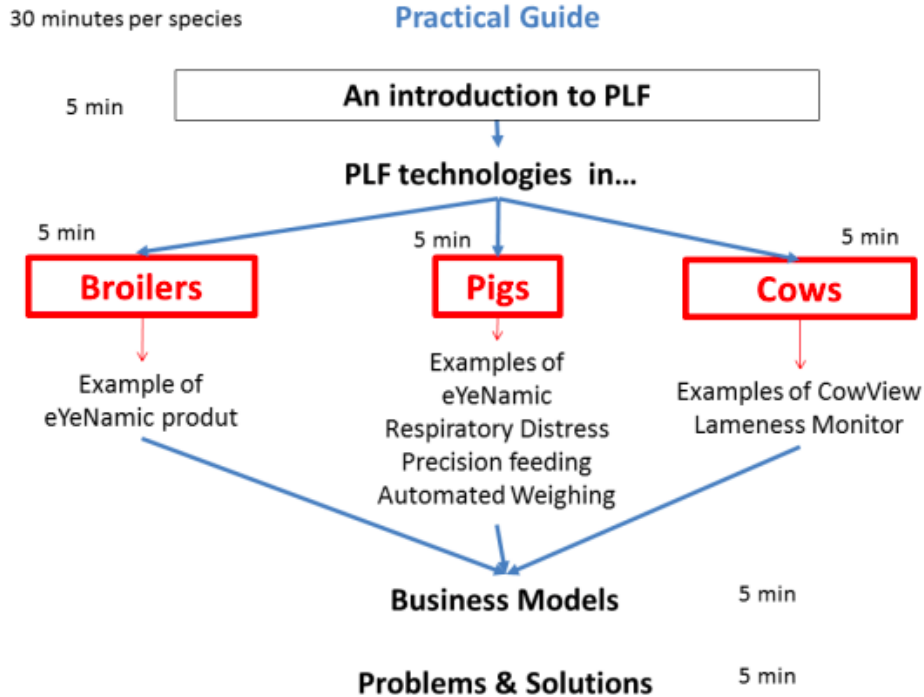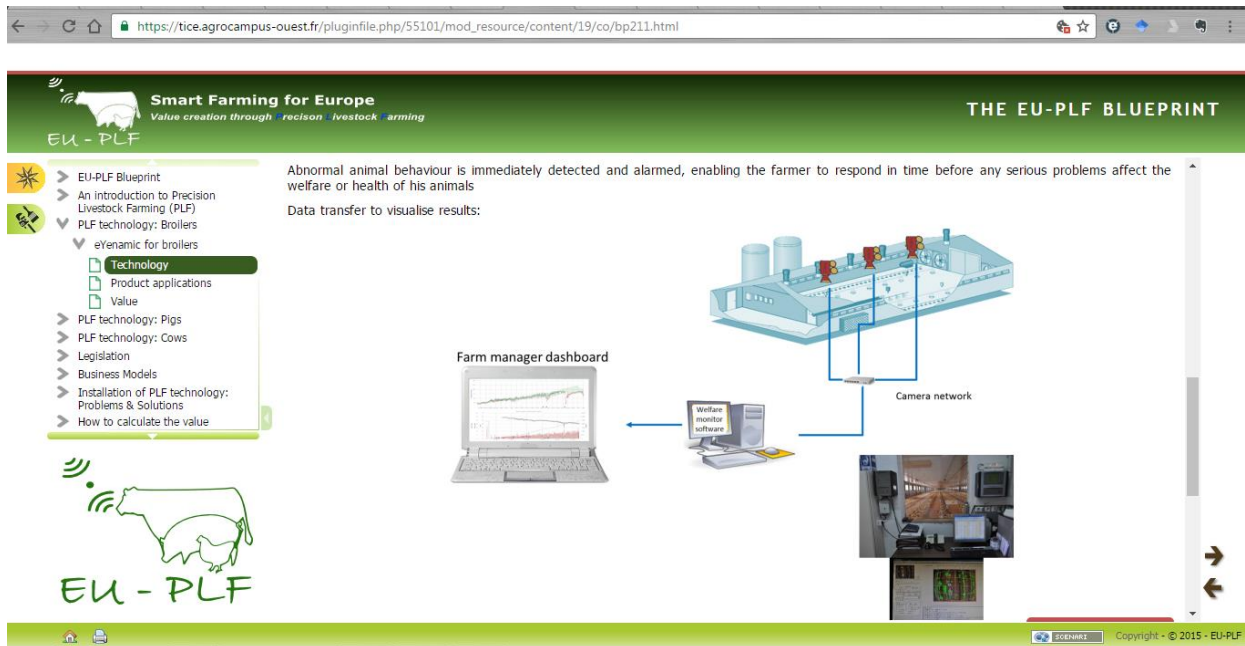
Figure 2. Blueprint logic line

Introduction to Precision Livestock Farming

Here the reader is introduced to the core arguments driving the development and application of PLF technologies. Most of these are already given in the text above but in the blueprint they are presented in a collaborations, and that currently systems are creating values for the farmers at the moment. The section finishes with a brief pictorial overview of examples in Precision Livestock Farming (PLF) systems far more visually appealing way, as the key aim is to deliver a high impact message as quickly as possible. The key of this section is that the tools for Precision Livestock Farming can only be developed through multidisciplinary.

Details on specific Precision Livestock Farming technologies

The following three sections discuss the details on the specific technologies in the field currently. For broiler production the eYeNamic systems is presented and its implementation is demonstrated schematically and through a commercial video. Figure 3 gives an overview of the eYeNamic discussion in the blueprint. The subsections include briefing on technology, applications of the product and value it creates for the farmer. The ambition is not only to present the product in a commercial sense but to highlight the scientific principles upon which it is based, and how the product can be used in an appropriate way to generate value for the farmer.

Figure 3. eYeNamic presentation

Legislation

In this section the new Animal Health Law (EC, 2016) that has been recently released in the EU is briefly discussed. This law brings together over 40 legal acts enforced in Europe in order to safeguard the health and welfare of livestock during the production process. A key aspect of this law that has not previously been considered is the need to link animal health and welfare, and increase efforts in animal health and welfare surveillance. This is where precision livestock farming can greatly assist the producers and veterinarians of the future.

Business models for PLF as a service

In this section an overview of how PLF can be practically realised as a service tool for farmers is introduced. Four different models are presented and discussed in enough detail to deliver the concept. These include:

Model 1 : PLF as a sensor

Here an economic description of how such a business model would work is given for the case where a farmer uses standard environmental measurements with PLF (biometric) sensors.

Model 2 : Early warning with PLF-technology

Here an economic description of how such a business model would work for a case where a farmer installs PLF sensor systems, and an early warning tool is used as part monitoring the production process.

Model 3 : Process optimisation with PLF-technology

Here an an economic description of how such a business model would work is given for the case where all PLF sensor techniques will be installed and the early warning tools will be used to monitor the production process, with flock or herd reports being made and used for on-farm process optimisation. These farm reports are based on references set by the genetic breeding potential of the animals, and the current market prices in the sector. These reports can be used to compare different flocks/herds within one year, or different houses within one round

Model 4 : Continuous consultancy and benchmarking of PLF data

Here an an economic description of how such a business model would work is given for the case where all PLF sensor techniques will be installed and the early warning tools will be used to monitor the production process, with flock or herd reports being made and used for on-farm process optimisation. Further to this meta-data analysis will be applied. Meta-data analysis implies that the flock/herd data are analysed on a daily level, and the process settings are updated on a daily level. Previously process settings were updated after each flock/herd report, whereas in this business model the process are updated during the production process. This gives the farmer more process control to compensate the volatile feed and meat prices.

As shown in Figure 4, the main future target of the service package is the linking of the different PLF solutions to create value for the farmer. This integration is done by the consultant.
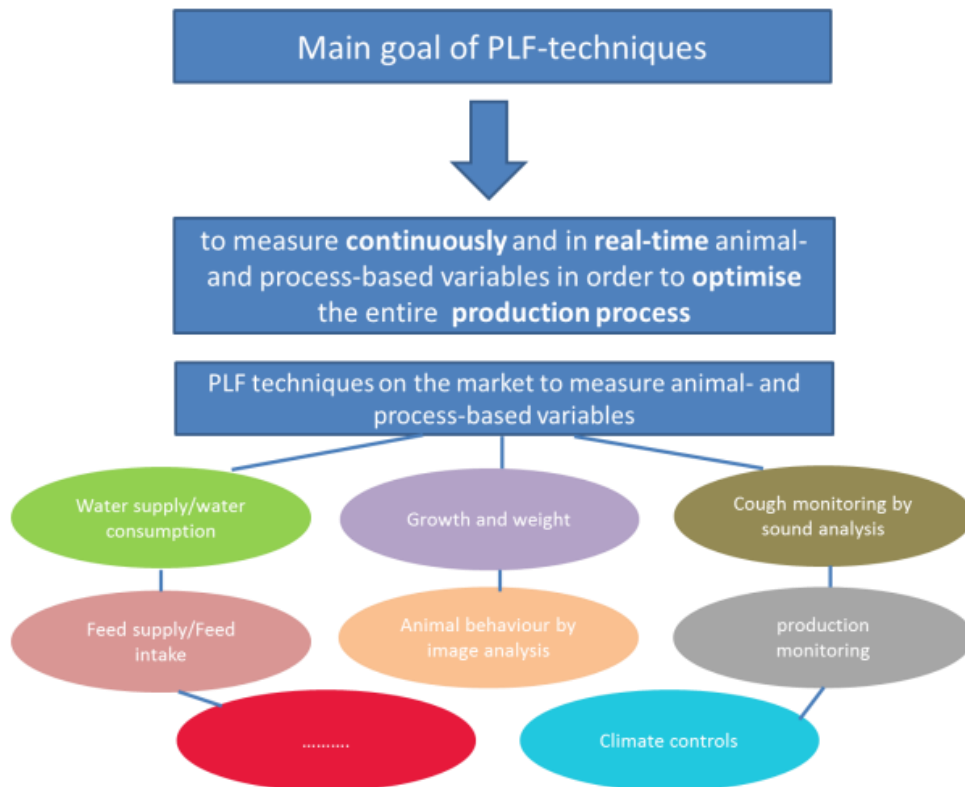
Figure 4. Schematic showing the integration of PLF products

Installation of PLF technology: Problems & Solutions

In this part, practical problems and solutions during installation of PLF technologies within EU-PLF are presented. During the project it was considered important to log all the key challenges faced and problems that occurred during installation and system follow-up. Below the key issues that we encountered are outlined for future developers to consider that have been highlighted in the blueprint.

Power –battery life of sensors

The battery life of PLF equipment requiring sensors to be worn by an animal (e.g. accelerometers) is a worry for farmers. It is essential that such sensors that the battery life does not incur a heavy work load on the farmer for recharging/replacing. Low power systems are therefore essential and therefore significant considerations must come into the transfer of data, i.e. the amount of data, frequency and range of transfer. To get around the problem PLF systems (typically for dairy) transfer small amounts of filtered data only once or twice a day to save on costs and power efficiency.

Power – stability on the farm

Power outages are regularly encountered on farms. The loss of power to a farm can affect the running of the equipment such as climate control, feeding or cooling equipment and can result in significant economic losses on livestock farms. PLF systems should act as a line of defence in detecting abnormalities on the farm and therefore must be robust to these outages. During EU-PLF the main advice emerged was that when in doubt about the stability of the on-farm power install an Uninterruptible Power Supply (UPS) to detect a power failure and quickly switches over to run your equipment on its battery.

Internet access on the farm

The instability of internet connections proved to be a significant problem for the installation and operation of PLF systems during the project. Farms are typically in less populated rural areas of a country and therefore the 3G network coverage is oftentimes poor. Moreover, the lack of broadband connections means that PLF solutions cannot rely completely on cloud-based data analysis at the moment.

Physical robustness of the systems

Livestock buildings need to be regularly cleaned by power washing. Therefore any sensor systems within a building needs to be able to withstand high pressure water jets. Technology providers must completely test their equipment and physical bracketing so failure doesn't occur. Moreover, the placement of the systems themselves or any associated wiring should not be within reach of the animals and be pest-resistant, otherwise they can become damaged or eaten.

Solutions

The main objective is not to point out the problems but to offer solutions to the farmers and technology providers. The blueprint present these solutions in a very accessible way so that producers and technologies can link to generic problems that are encountered (Figure 5).
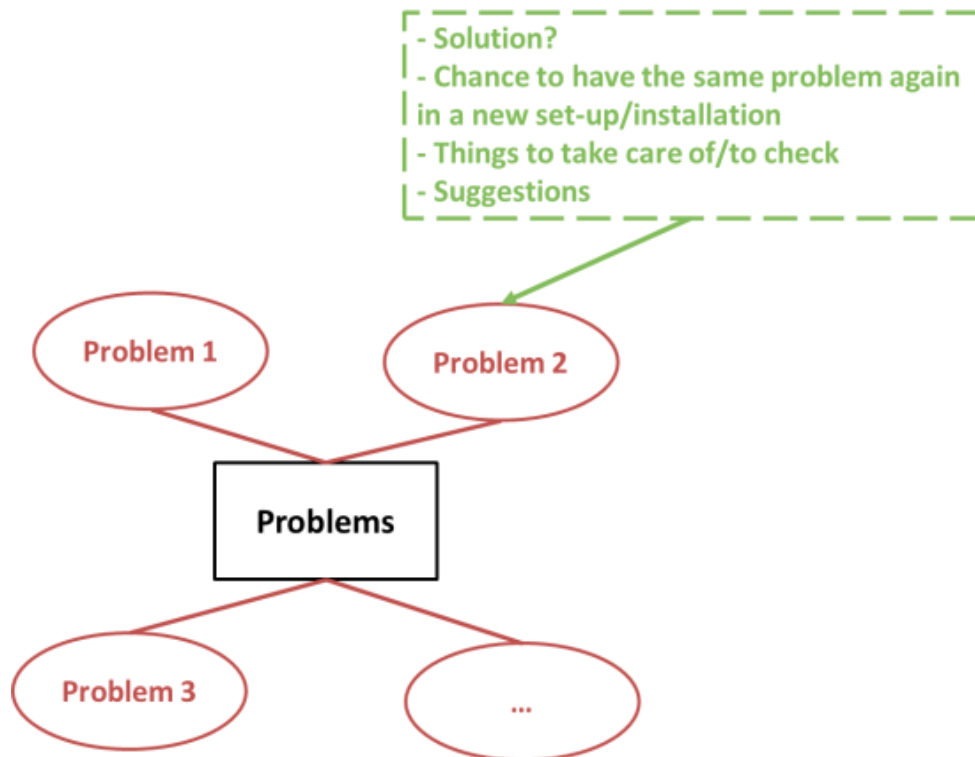
Figure 5. Schematic showing the problems and solutions when installing PLF products

How to calculate the value brought by PLF technologies for the farmer

In this section the benefits provided to the farmers are discussed and videos of testimonials contributed by the farmers and researchers are presented. The running message is that PLF is one piece of the puzzle that will enable a more sustainable animal production. Here it is highlighted that consumers and the society will benefit from the use of PLF technology, as it will allow them to have access to information on the welfare and health of the animals. And that PLF technology will allow a reduction in the use of medicine, particularly of antibiotics, and will contribute in reducing the impact of animal production on the planet.

Finally the tangible, semi-tangible and intangible benefits of PLF systems and calculated using a simulation tool developed by Wageningen University, who were a partner during the EU-PLF project. For the tangible benefits a simulation tool is provided for free download by the reader, with instructions on how to use it. An example is worked out for an automated heat detection system for dairy cows.

3. Conclusion

A Validated Blueprint for innovation in the European livestock sector has been created and published for all stakeholders to view. With the availability of this blueprint we hope to inform new companies

interested in the PLF industry on how to go from an idea to an operational system at farm level. In this way the Blueprint can serve as a manual for farmers, their surrounding industry including high tech Small and Middle-sized Enterprises and other stakeholders.